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WILLAMETTE RIVER TOXICS STUDY

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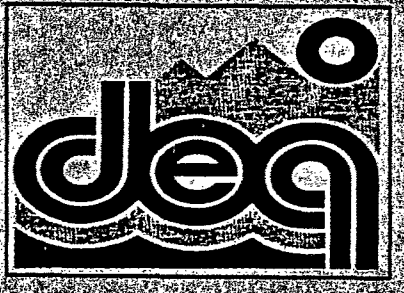

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APPENDICES

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WILLAMETTE RIVER TOXICS STUDY

1988 TO 1991

1 INTRODUCTION

A study investigating the presence and effects of toxic pollutants in the Willamette River and selected tributaries was conducted by the Oregon Department of Environmental Quality (DEQ) in cooperation with the U.S Environmental Protection Agency (EPA) and Oregon State University (OSU). Its stated objectives were to determine if bioaccumulative toxic pollutants were present in the sediments and fish tissue and to determine the possible effects of the pollutants present on the aquatic resources using bioassays and other aquatic life toxicity testing methods.

This study was planned as a screening survey to add to the existing toxic pollutants data base for the Willamette River. The sampling sites selected were used for previous toxics monitoring and were chosen to represent ambient levels, significant industrial and municipal sources, and typical urban non-point source impact. The knowledge gained from this study will be added to that from previous studies to plan future DEQ toxics monitoring.

Sediment samples collected from the mainstem and tributaries to the Willamette were analyzed for physical and chemical parameters. Selected sediment samples were analyzed for toxicity through the use of microtox and elutriate and solid-phase sediment bioassays. Aquatic life monitoring was performed on fish collected from the mainstem and tributaries to the Willamette. Chemical residue analysis was performed on the tissue of collected species of fish and crayfish. Fish health assessments, growth assays, and enzyme induction assays were performed for biological samples collected from selected stations.

2 STUDY PLAN

2.1 SAMPLING LOCATIONS AND PARAMETERS

Sediment collected at a total of twenty-six stations and fish tissue from twenty-one stations were analyzed for a variety of toxic chemicals. Both sediment and fish tissue were collected at fourteen of those stations (Table 1).

Pesticides and arochlor PCBs were analyzed in sediment and fish tissue for all stations except one sediment station. Co-planar PCBs, PAHs, polychlorinated dibenzo-p-dioxins (PCDD), polychlorinated dibenzofurans (PCDF), and metals were analyzed for selected stations (Tables 2 & 3). Table 4 lists the sediment chemical analysis parameters for the chlorinated pesticides, arochlor PCBs, PAHs, dioxins/furans, and metals. The chlorinated pesticides, PCBs, dioxins/furans, PAHs, and metals analyzed in fish tissue are listed in Tables 4 and 5 by year of analysis. The fish species collected and tissue type used for analysis are in Table 6.

Solid-phase and elutriate sediment bioassays were performed on samples collected at seven stations on the Willamette River. Microtox sediment bioassays were performed at thirteen stations: seven on the Willamette River, and one each on the Columbia Slough, Tualatin River, Fanno Creek, Beaverton Creek, Yamhill River, and Conser Slough (Table 1).

The elutriate sediment bioassays performed in 1988 used the test organism *Daphnia magna*. Solid-phase sediment bioassays were performed using *Daphnia magna* and *Hyallela azteca* in 1988 and *Daphnia magna* and *Chironomus riparius* in 1989.

Fish health assessments were performed for four stations on the Willamette River and one station each on the Santiam River and the Conser. Enzyme assays were performed for four stations on the Willamette River and for one station on the McKenzie River. Growth assays were performed for two stations, one on the Willamette River 7 and one on the Clackamas River (Table 1).

The fish health assessment was a qualitative examination of the exterior and organs of fish for gross disturbances. The examinations are ranked according to the Goede methodology (Goede, 1988). Control stations can then be compared to stations within affected areas for differences.

Enzyme analysis was performed for Aryl Hydrocarbon Hydrolase (AHH) and Ethoxyresorufin-o-deethylase (EROD) in livers of whitefish collected from the mainstem Willamette River. AHH and EROD activity is induced upon exposure to certain chlorinated organic compounds (specific congeners of dioxins, furans, and PCBs).

2.2 SAMPLING METHODS

2.2.1 Sediment

Sediment samples were collected with a stainless steel eckman dredge. Three to five grabs were collected per sample. Grabs were placed in a stainless steel bucket and homogenized with a stainless steel or teflon spatula. The homogenized sample was placed in a sample jar and placed in a cooler containing ice.

All sampling and homogenizing equipment was cleaned with acetone, hexane, nitric acid, and a distilled water rinse, in that order. Following the distilled water rinse, the equipment was rinsed with river water. The first grab for a sample was collected, placed in the stainless steel bucket, mixed using the spatula, and discarded. The following three to five grabs were retained for homogenization and placement into the sample jar. The sample was refrigerated at 4°C if analysis was imminent; if a longer holding time was expected, the sample was frozen.

2.2.2 Fish Tissue

Fish were collected with electroshocking equipment for chemical analyses, health assessments, enzyme assays, and growth assays. Fish health assessment measurements were performed in the field immediately after collection. Fish collected for whole-body chemical analysis were rinsed with water, measured for length and weight, wrapped in aluminum foil, and placed in a cooler with ice. Fish collected for chemical analysis of edible flesh were measured for length and weight prior to dissection. Edible portions, either fillets or steaks, were cut from the whole body with a stainless steel knife, wrapped in aluminum foil, and placed in a cooler with ice. The stainless steel knife was rinsed clean with distilled water between samples.

Fish samples were transported to the Department of Environmental Quality's (DEQ's) laboratory and placed in a freezer. Samples were kept frozen until processed for chemical analysis.

Fish collected for enzyme analysis had the livers removed immediately after collection. The livers were placed in ziplock plastic bags which were immediately frozen using dry ice. Samples were transported to the DEQ lab and placed in a freezer until shipment to the Department of Fisheries and Oceans in Winnipeg, Manitoba for analysis.

2.3 ANALYTICAL METHODS

2.3.1 Sediment Chemistry

Sediment chemical analysis was performed ac-

cording to DEQ standard analytical techniques.

- ***Chlorinated Pesticide Analysis:***

Sediment samples analyzed for chlorinated pesticides were extracted according to EPA Method 3540, gel-permation cleanup according to EPA method 3640, and analyzed by gas chromatography/mass spectrometry by capillary technique according to EPA Method 8080.

Soxhlet Extraction: 10 g of sample was blended with approximately 10 g of anhydrous sodium sulfate, placed in an extraction thimble and spiked with a surrogate solution. The sample was extracted for 18 hours with 300 ml of a 50:50 hexane/acetone mix. The extract was dried by passing through an anhydrous sodium sulfate drying column and concentrated in a KD concentrator.

Gel-Permeation Clean Up: 70g of Spectra/Gel MP-2 were pre-swelled with methylene chloride and slurry packed into the chromatographic column. The extract was passed through the column.

- ***PCB Analysis:***

Sediment PAH analysis was performed according to EPA Method 3540 and 3640 for extraction and gel-permation clean up. Analysis was performed according to EPA Method 8080.

- ***Dioxin Analysis:***

Sediments were analyzed for dioxin according to EPA Method 1613A.

- ***PAH Analysis:***

Sediment PAH analysis was performed according to EPA Method 3540 and 3640 for extraction and gel-permation clean up. Analysis was performed according to EPA Method 8270.

GC/MS Capillary Column Technique: 1 ml of final extract was spiked with an internal standard solution and analyzed by GC/MS using a 30m x 0.25 MM DB5 fused silica column. The initial 5 point calibration was performed as recommended with PAH retention times relative to 6 deuterated internal standards, D4-1,4-dichlorobenzene, D8-naphthalene, D10-acenaphthene, D12-chrysene, and D12-perylene. Daily system tuning, calibration check standards and blanks were performed as per method QC. Mass spectral qualitative and quantitative evaluations were performed as per method specifications using one quantitative mass and two criteria masses.

- ***Metals Analysis:***

Sample digests were analyzed by graphite furnace (GFAAS) or flame atomic absorption (AAS) methods per "Methods for the Chemical Analysis of Water and Wastes", USEPA, EPA-600/4-82-020.

2.3.2 Fish Tissue Chemistry

Fish tissue chemical analysis was performed according to DEQ standard analytical techniques.

- ***Chlorinated Pesticide Analysis:***

Tissue samples were extracted, florisil clean up, fractionated, and analyzed by GC/MS.

Extraction — Approximately 25-30 ±0.1g of tissue into an Omnimixer and homogenized with 50 ml of acetonitrile for 3 minutes. The acetonitrile is decanted into a fired quart sampling jar. This is repeated twice. The Omnimixer was rinsed with 30 ml of acetonitrile. The acetonitrile extracts, tissue residue, and rinse were to one fired rinsed quart sampling jar. 50 ml of 20 percent sodium sulfate/15 percent monobasic potassium phosphate solution, 350 ml of water, and 225 ml of 50 percent methyl tertiary butyl ether (MTBE)/50 percent hexane solution were added to the jar. The organic phases are allowed to separate. Transfer 20 g of fish tissue equivalent to a 250 ml graduated cylinder by gravity siphon of the upper layer. The extract was eluted through a Hexane prewashed anhydrous sodium sulfate column into a Kuderna-Danish concentrator. Rinse with 50 ml of hexane and concentrate MTBE/hexane to approximately 10 ml final volume by steam bath.

Florisil Clean Up — A glass chromatography column (30cm X 2.5cm ID) plugged with pyrex glass wool with 20g of florisil and 1-2 cm of anhydrous sodium sulfate added to the top of the column was prepared for clean up of the tissue hexane extract. The column was pre-eluted with 60 ml of hexane at 5 ml/minute and discarded. The tissue hexane extract was added to the column and the sample vial rinsed with hexane.

Fractionation — Fraction I was eluted by adding 200 ml of 6 percent diethyl ether in hexane to the florisil column and collected in a Kuderna-Danish concentrator. Fraction II was eluted by adding 200 ml of 15 percent diethyl ether in hexane to the florisil column and collected in a second Kuderna-Danish concentrator. Fraction III was eluted by adding 200 ml of 50 percent diethyl ether in hexane and collected in a third Kuderna-Danish concentrator. Each fraction was concentrated to <10 ml using steam bath and the volume reduced to <0.5 ml with N-EVAP. The final volume was adjusted to 10 ml with hexane. Final fractions were stored in glass vials in the freezer.

GC Analysis — A Varian CDS 654 was calibrated using appropriate chlorinated pesticide standards. Standards were injected and appropriate peak retention times were noted for calibration. 0.5ul of sample extract was injected into a Varian 6000 GC. Comparison is made between known standards and samples with respect to agreement of concentration, peak shapes, and retention time offsets.

- ***PCB Analysis:***

PCB extraction, florisil clean up, fractionation, and GC analysis was accomplished through the chlorinated pesticide procedure with the exception of appropriate PCB standards were used for comparison with samples. The standards were linked together in the analysis mode through the PCB-Capillary method (PCB-CAP).

- ***Dioxin/Furan Analysis:***

Dioxin and furan analysis was performed according to EPA Method 1613A.

- ***Metals Analysis:***

The method is an adaptation of the total metal analysis of fish per the "Interim Methods for the Sampling and Analysis of Priority Pollutants in Sediments and Fish Tissue", USEPA, EMSL-Cincinnati, OH, 45268, 8/1977, Rev 10/1980. Sample digests were analyzed by graphite furnace (GFAAS) or flame atomic absorption (AAS) methods per "Methods for the Chemical Analysis of Water and Wastes", USEPA, EPA-600/4-82-020.

- ***PAH Analysis:***

PAHs were extracted by the same procedure used for pesticide extraction. Samples were analyzed for PAHs by EPA Method 8270.

2.3.3 Sediment Bioassays

Sediment bioassays were performed according to DEQ standard analytical techniques:

- ***Solid Phase Analysis:*** *Daphnia magna*, and/or *Chironomus riparius*, or *Hyallela azteca* were exposed in an acute test to solid phase sediment and dilution water. The length of the *D. magna* test was 48 hours, while the *C. riparius* and *H. azteca* test was for ten days. Test sediment and water was obtained by adding the sediment sample to dilution water (1:4, v/v, mix of sediment and water) and then settled overnight. Survival at the end of the test period was the criterion for the test.

- ***Elutriate Phase Analysis:*** *Daphnia magna* were exposed in a 48-hour acute test to dissolved materials extracted from sediment. Test water was obtained by mixing control water with contaminated sediment (1:4, v/v, mix of sediment and water) and then settled and centrifuged. Survival was the criterion for the test.

- ***Microtox Analysis:*** Sample was extracted from the sediment in an aqueous phase by centrifuge. The sample was mixed with a fluorescent marine bacteria; the light emitted was read on a spectrophotometer. A decrease in

light emission in a sample as compared to a blank indicated the presence of toxic material.

2.3.4 Fish Health Assessments

10-20 Northern Squawfish per station were collected for use in the fish health assessments. Fish health assessments were performed according to Goede (1989). The fish health assessment consisting of external and internal observations of tissues were performed for qualitative determination of abnormalities. The tissues examined were the skin, fins, eyes, gills, pseudobranchs, thymus, mesenteric fat, spleen, hind gut, kidney, liver, and bile. Blood hematocrit, leucocrit, and plasma protein analysis were performed. Length and weights were recorded for each fish.

2.3.5 Enzyme Assays

Preparation of microsomes and enzyme AHH and EROD, and cytochrome P-450 assays were performed as described by Lockhart and Metner memo 1991. Microsomes were prepared through differential centrifugation (Lockhart 1989). AHH assay was measured the production of polar metabolites from non-polar tritiated benz(a)pyrene used as a substrate (Lockhart 1989). EROD was measured by the deethylation of 7-ethoxyresorufin to yield resorufin which was detected by a spectrophotometer (Lockhart 1989). Cytochrome P-450 spectra were recorded with a single beam Beckman DU-7 spectrophotometer according to Omura and Sato 1964 a,b (Lockhart memo 1991).

2.3.6 Growth Assays

Twelve to eighteen sculpins were collected from a contaminated area and an uncontaminated control area. These fish were transported to Oregon State University laboratories for testing. Three groups of four to six individuals from each site were fed at one of three rations for 21 days. Rations were selected to achieve "fast", "moderate", and "slow" growth. Fast growth occurs at a near-maximal consumption rate; moderate and slow growth occur at approximately 50 percent and 10 percent of the maximal consumption rate, respectively.

Environmental temperatures and the general physiological condition of the fish influence consumption and growth. Fish were housed separately to permit *ad libitum* consumption measurements for approximately the first seven days of the test. Conditions maintained during the test were: flowing well water within 2 degrees Celsius of field-collection temperature; dissolved oxygen between 9 and 10 mg/l; and pH ranging from 7.0 to 7.4. Additional experimental details and calculations were according to Shubat (1986), Curtis (1985), and Seim (1984).

3 RESULTS

3.1 SEDIMENT

The following sediment chemistry results were for samples collected from 1988 through 1990 at all stations. Sediment chemistry results according to river mile and year can be found in Appendix A.

3.1.1 Pesticides

Between 1988 and 1990, 32 samples from the mainstem Willamette River were collected by DEQ for pesticide analysis. Five pesticides were detected: alpha-BHC detected once; beta-BHC detected three times; p,p' DDE and p,p' DDT detected five times each; and p,p' DDD detected eight times. Most pesticide detections were less than 1 ppm, with the exception of p,p' DDD and p,p' DDT which were detected at concentrations of 1.4 and 1.64 mg/kg wet weight, respectively (Table 6). Median values for beta-BHC, p,p' DDE, p,p' DDD, and p,p' DDT were 0.008, 0.080, 0.027, and 0.021 mg/kg wet weight, respectively (Table 7).

Between 1988 and 1990, twenty samples from tributaries to the Willamette River were collected by DEQ for pesticide analysis. Four pesticides were detected: endrin aldehyde once, p,p' DDE eleven times, p,p' DDD times, and p,p' DDT eight times.

The pesticides were detected at concentrations below 1 ppm; median values were 0.018 mg/kg wet weight for p,p' DDE; 0.015 mg/kg wet weight for p,p' DDD; and 0.051 mg/kg wet weight for p,p' DDT.

3.1.2 PCBs

Between 1988 and 1990, 32 samples from the mainstem Willamette River were analyzed for PCBs. Arochlor 1254 was detected in two samples with a median value of 2.225 mg/kg wet-weight; Arochlor 1260 was detected in three samples with a median value of 0.260 mg/kg wet-weight (Table 8).

Twenty samples collected from Willamette River tributaries were analyzed for Arochlor PCBs: Arochlor 1254 was detected five times with a median value of 0.089 mg/kg wet weight and Arochlor 1260 was detected twice with a median value of 0.185 mg/kg wet weight (Table 9).

3.1.3 PAHs

There were 22 PAHs detected in samples collected from the mainstem Willamette River. Generally, the median values were below 1 ppm, with the exception of Dibenzothiophene (with a median of 1.640 mg/kg wet weight) and Dibenz(ah)anthracene (with a median of 5.094 mg/kg-wet weight) (Table 9). However, maximum values for several PAHs were above 100 ppm in samples collected at river mile 7 in 1988 (Table 9).

Sixteen PAHs were detected in samples collected from tributaries to the Willamette River. PAHs were detected in less than one half of the samples with the exceptions of Phenanthrene, detected in nine of sixteen samples; Fluoranthene, detected in ten of sixteen samples; and Retene, detected in six of nine samples. PAH median values were generally less than one part per million with the exception of Acenaphthylene and Acenaphthene, with median values of 33.000 and 16.505 mg/kg wet weight, respectively (Table 9).

3.1.4 Dioxins & Furans

There were four mainstem and six tributary sediment samples analyzed for dioxins and furans. TCDD was detected in one mainstem sample at a concentration of 0.42 ng/kg wet-weight. Five of the tributary sample stations were located in drainage ditches near wood treating facilities. The other tributary station was located at river mile 8 of the Middle Fork Willamette River. TCDD concentrations from the drainage ditch stations ranged from 4.2 to 66 ng/kg wet-weight. TCDF concentrations ranged from nondetected at 2.2 ng/kg to 98 ng/kg wet-weight. Other dioxins and furans were detected orders of magnitude higher than TCDD and TCDF. For instance, 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin and 1,2,3,4,7,8,9-Heptachlorodibenzo furan ranged from 920 to 220,00 ng/kg wet-weight and 170 to 16,000 ng/kg wet-weight, respectively. TCDD and TCDF were not detected at the Middle Fork Willamette River station (Table 10).

3.1.5 Metals

Metals were detected in most samples collected from the mainstem and tributaries to the Willamette River (Table 11). Median concentrations values for cadmium and mercury were below 1 ppm. Arsenic median values were below 10 ppm. Chromium, copper, and lead median values were below 30 ppm. The median value for zinc was approximately 75 ppm for the mainstem and 114 ppm for the tributaries. Maximum values exceeded 100 ppm for copper, lead, and zinc for the mainstem and 100 ppm for chromium, copper, lead, and zinc for the tributaries.

3.1.6 Sediment Bioassays

In 1988, sediment from six stations was collected for elutriate and solid-phase sediment bioassays (Table 1). *Daphnia magna* was the test organism used for the elutriate tests; *Daphnia magna* and *Hyallela azteca* were used for the solid-phase tests. A Fischer's Exact test at alpha = 0.05 was used for determining significant difference between stations.

There was no significant difference observed between the six stations tested in 1988. Survival was 80 percent or greater in all replicates at all stations (Table 12).

In 1989, sediment from six stations and a control were collected and tested for sediment toxicity (Table 13). Solid-phase bioassays were performed with *Daphnia magna* and *Chironomus riparius*; no elutriate tests were performed. *Daphnia magna* survival was 87 percent or better while *Chironomus riparius* survival was 65 percent or better. There was no significant difference observed between the stations tested.

Microtox assays were performed on sediments collected from fourteen stations in 1989 (Table 14). A stimulatory effect was observed in four samples and no toxic effect was observed in two samples. Samples from seven stations caused a 50 percent reduction in light output (EC50). The EC50 values ranged from 5 g/l for a sample from Conser Slough to 863 g/l for a sample collected from the Willamette River at river mile 52.

3.1.7 Fish Health Assessments

Fish health assessments using the Goede methodology (Goede, 1989) were conducted at five stations in 1988 and four stations in 1989 (Table 1). Two of the three mainstem Willamette River stations were similar in percent normals with the station at river mile 47 having lower percent normals for eyes, gills, thymus, spleen, and liver than stations at river miles 7 and 38 (Table 15).

3.1.8 Enzyme Induction

Enzyme assays were performed on samples of whitefish collected in 1990; livers were analyzed for EROD and AHH (Table 1).

Minimum EROD values ranged from 0.0005 to 0.001 nmol/mg-protein/min to maximum values of 0.001 to 0.023 nmol/mg-protein/min. Mean EROD values ranged from 0.0006 nmol/mg-protein/min at the Mid Fork Willamette River station to 0.0067 nmol/mg-protein/min at the river mile 143 station (Table 16).

Minimum AHH values ranged from 0.005 to 0.0150 nmol/mg-protein/min with maximum values of 0.0210 to 0.0510 nmol/mg-protein/min. Mean AHH values ranged from 0.0154 nmol/mg-protein/min at river mile 176 to 0.0282 nmol/mg-protein/min at river mile 145 of the Willamette River (Table 16).

Statistical comparison of group means between stations was performed with Duncan's multiple range test. There was no significant difference between station means for EROD activity ($F=1.70$, $p=0.173$) or AHH activity ($F=0.98$, $p=0.451$).

3.1.9 Growth Assays

There was no significant difference in growth of sculpins collected from the Willamette River at river mile 7 and control stations.

3.2 FISH TISSUE

The species collected for tissue analysis were carp, squawfish, sucker, largemouth bass, cutthroat trout, crayfish, and whitefish. Tissue types used for analysis were whole body, edible flesh, and liver. Species and tissue type varied from station to station and from year to year (Table 3).

The following fish tissue results were for samples collected from 1988 through 1990 at all stations. Fish tissue results according to river mile and year can be found in Appendix B.

3.2.1 Pesticide Analysis

A total of 66 samples were collected from the mainstem Willamette River for pesticide analysis; a total of 18 pesticides were detected (Table 17). Three pesticides (heptachlor, p,p' DDE, and p,p' DDD) were detected in greater than 20 percent of the samples collected. Heptachlor, p,p' DDE, and p,p' DDD, were detected in 31, 64, and 38 percent of the samples, respectively.

Evaluation values (e.g., criteria, action levels, etc.) are available for 14 of the 18 pesticides detected in samples from the mainstem (Table 18). Evaluation values are available for the three most commonly detected pesticides. Maximum values for these three pesticides did not exceed the FDA action levels but did exceed the EPA/TV (Table

17). The dieldrin concentration in one sample was above the FDA action level (Table 17).

A total of 30 samples were collected from tributaries to the Willamette River and analyzed for pesticides; 8 pesticides were detected (Table 19). Two pesticides (p,p' DDE and p,p' DDT) were detected in greater than 20 percent of the samples collected. p,p' DDE and p,p' DDT were detected in 60 and 27 percent of the samples, respectively.

Fish tissue evaluation values were available for six of the eight pesticides detected in tributary samples (Table 18). Maximum values for the two most commonly detected pesticides were below the FDA action levels but above the EPA/TV.

3.2.2 PCB Analysis

Thirty-four samples from the mainstem and six samples from the tributaries were analyzed for co-planar PCBs. Three co-planar PCBs were detected in mainstem Willamette River samples with one, 3,3'4,4' TCBP, detected in greater than 20 percent of the samples. Three co-planar PCBs were detected in tributary samples with all three detected in greater than 20 percent of the samples (Table 20). Maximum values were below FDA action levels and above the EPA/TV.

Sixty-six fish-tissue samples from the mainstem and 14 samples from the tributaries were analyzed for Arochlor PCBs; three Arochlor PCBs were detected (Table 20). Arochlor 1260 was detected in greater than 20 percent of the samples from the mainstem Willamette River and tributaries. Maximum values were below FDA action levels and above the EPA/TV.

3.2.3 Dioxin & Furan Analysis

Sixteen fish-tissue samples, 13 from the mainstem and 3 from tributaries to the Willamette River, were analyzed for dioxins and furans (Table 3). TCDD was detected in 15 samples and TCDF was detected in 16 samples. The TCDD, TCDF, and TEC maximum values were 7.9, 30, and 14.07 ng/kg wet weight, respectively. All detected values were above the EPA/TV and below the FDA guidance value (Table 21).

3.2.4 PAH Analysis

Four samples, three carp and one squawfish, had detectable concentrations of PAHs. These samples were collected in 1989 from the mainstem Willamette River. The PAHs detected were benzo(a)-anthracene, benzo(b)fluoranthene, naphthalene, acenaphthene, benzo(k)fluoranthene, and benzo(a)-pyrene. The concentrations ranged from 0.5 to 0.8 mg/kg wet-weight (Appendix D).

3.2.5 Metals Analysis

Twenty-five mainstem fish tissue samples were analyzed for metals: seven metals were detected (Table 22). Arsenic, chromium, and lead were detected once and cadmium was detected twice and copper, mercury, and zinc were detected in all samples. Maximum values for copper, mercury, and zinc were 0.780, 0.460, and 16.280 mg/kg wet-weight, respectively.

Eleven tributary fish-tissue samples were analyzed for metals; seven metals were detected (Table 22). Barium, copper, mercury, and zinc were detected in all samples and had maximum values of 7.220, 19.890, 0.490, 17.720 and 19.870 mg/kg wet-weight, respectively. Cadmium, chromium, and lead were detected in greater than 50 percent of the samples with maximum values of 0.060, 0.080, 0.180 mg/kg wet weight, respectively.

Fish tissue evaluation values were available for three of the metals (Table 18). Maximum values from the mainstem or tributary samples were not above the evaluation value for metals in fish tissue (Table 22).

4 SUMMARY

4.1 SEDIMENTS

4.1.1 Mainstem Willamette

The frequency of detection was twenty-five percent or less for chlorinated pesticides and less than ten percent for PCBs. Four PAHs were detected with a frequency of greater than fifty percent. These PAHs were phenanthrene, fluoranthene, benzo(a)anthracene, and chrysene. Median values for these PAHs were

below 1 mg/kg wet-weight and had maximum values ranging from 200 to 900 mg/kg wet-weight (Table 9 and Appendix C). The median values were below the evaluation guideline number (50 mg/kg) used for evaluating sediments for dredge disposal. The values greater than 100 mg/kg wet-weight were from samples collected in 1988. All other samples were generally less than 1 mg/kg wet-weight or nondetected.

TCDD was detected in one mainstem sediment sample collected at river mile 147. TCDD and TCDF were not detected in any other mainstem Willamette River samples. There were other dioxins and furans detected in these samples (Table 23).

Inorganic compounds were detected in all samples. Arsenic, cadmium, chromium, copper, lead, mercury, and zinc median values were all below and the maximum values were all above the *Oregon Interim Dredge Disposal Guidelines* (IDG) (Table 24). Chromium, copper, and lead median values ranged from 20 to 26.7 mg/kg wet-weight. The highest concentrations for inorganics were detected in samples collected in 1988 (Table 25).

4.1.2 Tributaries

The chlorinated pesticides DDE and DDD were detected at a frequency of fifty percent or greater in samples collected from tributaries. Tributaries with detectable concentrations were Columbia Slough, Johnson Creek, Tualatin River, Fanno Creek, Beaverton Creek, and Conser Slough (Table 26). The Johnson Creek DDT+ metabolites values were greater than the IDG values. All other tributary values for this parameter were below the IDG value.

Five PAHs were detected at a frequency of 50 percent or greater in samples collected from the tributaries. These PAHs were phenanthrene, fluoranthene, chrysene, benzo(b)fluoranthene, and benzo(k)fluoranthene. Median values were below 1 mg/kg wet-weight and the maximum values ranged from 0.37 to 1.2 mg/kg wet-weight (Tables 9 and 27). The median and maximum values were below the evaluation guideline values used for dredge disposal.

TCDD and TCDF were detected in sediments collected from drainage ditches near wood treating facilities (Table 23). These values ranged from 4.2 to 66 ng/kg wet-weight for TCDD and from nondetected at 5.4 to 98 ng/kg wet-weight for TCDF. Other dioxins and furans were detected in these samples. The TCDD and TCDF maximum values were higher than the sediments collected at river mile 147. These values would be consistent with data collected from other wood treating facilities (PTI).

Inorganics were detected in all samples. The median values were below the IDG values. The maximum values for cadmium, chromium, copper, lead, mercury, and zinc were detected in a samples collected from Beaverton Creek in 1989 (Table 25). These values were above the IDG values (Table 24).

4.2 SEDIMENT BIOASSAYS

Sediment samples did not exhibit acute toxicity as measured by elutriate and bulk phase bioassays. Sediment chemistry and bioassay results can be found in Tables 28, 29, 30, 31, and 32. Samples collected from the Willamette River at river mile 7 and the Columbia Slough came from areas with detectable concentrations of DDE, DDD, and DDT. PCBs were detected in 1988 at river mile 7 and in sediments collected from the Columbia Slough. PAHs were detected at all bioassay stations. Metals were ubiquitous with the exception of nondetected values for cadmium at river mile 8, 16, and 38 or for mercury at river mile 38 (Table 32).

Nearly all samples examined by microtox exhibited a significant deflection from the norm. The analytical method used may be responsible for this occurrence.

4.3 FISH HEALTH ASSESSMENT

The mainstem stations were lower in percent normals than the two tributary stations. The gills, pseudobranchs, and liver had the lowest percent normals of the eight organs studied (Table 14).

4.4 ENZYME ASSAYS

There was not a significant difference between stations analyzed for AHH or EROD. Spectra results from analysis indicate that there could have been sample degradation. Sample degradation would have caused lower EROD values, negating differences between stations.

4.5 FISH TISSUE CHEMISTRY

4.5.1 Mainstem Willamette River

The frequency of detection was less than fifty percent for chlorinated organics with the exception of DDE which was detected in 62 percent of the samples. DDE was detected in 79 percent of the carp and in 63 percent of the squawfish (Tables 33 and 34). DDE was detected in two cutthroat trout samples at 0.006 and 0.023 mg/kg wet-weight (Table 33). The maximum concentration in carp, 0.266 mg/kg wet-weight, was detected at river mile 28 (Appendix D). DDE was detected at each mainstem Willamette River station. Eight of ten cutthroat trout samples had detectable levels of heptachlor with a maximum concentration of 0.008 mg/kg wet-weight (Table 34).

TCDD was detected in all but one sample and TCDF was detected in all samples (Table 20). Whitefish collected in 1990 and 1991 upstream of river mile 147 had lower median and maximum values of both TCDD and TCDF than whitefish collected downstream of river mile 147 (Table 35). Whitefish collected in 1990 had higher median and maximum concentrations of TCDD and TCDF than whitefish collected in 1991 (Table 36). Whitefish collected downstream of river mile 147 in 1991 had higher concentrations of TCDD and TCDF than carp collected downstream of river mile 147 in 1991 (Table 37).

Copper, mercury, and zinc were detected in the 25 samples analyzed for metals (Table 21). The mercury median value was 0.150 mg/kg wet-weight and the maximum value was 0.460 mg/kg wet-weight. The maximum mercury concentration was detected in carp but carp had a lower median concentration than squawfish, 0.155 and 0.285 mg/kg wet-weight, respectively (Table 38).

4.5.2 Tributaries:

The frequency of detection for chlorinated organic pesticides was less than 50 percent with the exception of DDE which was detected in 60 percent of the samples with a median value of 0.011 mg/kg wet-weight and a maximum value of 0.160 mg/kg wet-weight (Table 18). DDE was most frequently detected in samples from Johnson Creek (sixteen of sixteen samples) with a median value of 0.014 mg/kg wet-weight and a maximum value of 0.160 mg/kg wet-weight (Table 39). The DDT & metabolites concentrations in crayfish collected from Johnson Creek were evaluated by the Oregon State Health Division and were determined not to be a significant threat to human health and safe for human consumption (OSHD).

Two PCB isomers, 3,3'4,4' tetrachlorobiphenyl and 2,3,3'4,4' pentachlorobiphenyl were detected in 67 and 50 percent of the samples with maximum values of 0.011 and 0.004 mg/kg wet-weight, respectively (Table 19).

Barium, cadmium, chromium, copper, lead, mercury, and zinc were detected in greater than fifty percent of the samples (Table 22). Mercury was detected in the eleven samples collected from tributaries and had a median and maximum concentration of 0.100 and 0.490 mg/kg wet-weight, respectively (Table 21). The maximum concentration is below the FDA action level for mercury.

Table 1: Sampling Stations

Station (River Miles)	Year			
	1988	1989	1990	1991
Mainstem				
6	sd			
7	sd, ft, bio, fh	sd, ft, bio, mx	sd, ft	
8	sd	sd, mx		
14		sd, mx		
16	sd, bio			
18		sd, ft, bio, mx		
27	sd, ft	sd, bio, mx		
28		ft		
38	sd, ft, bio, fh	sd, ft, fh		
47	fh	sd, bio, mx, fh		
48	sd, ft	ft		
52		sd, bio, mx		
74		sd, ft, fh	sd, ft	
115		fh		
131			sd, ft	
141				ft
143			ft, ea	ft
145			sd, ft, ea	ft, sd
147			sd, ft, ea	sd
161			sd, ft	sd, ft
176			ft, ea	
Tributary				
Columbia Slough (1 – 5)	sd	sd, mx		
Johnson Creek (0.5 – 18)				sd, ft
Clackamas River (8.0)	sd, bio			
Audubon Pond		bio		
Tualatin (5.0)	sd	sd, ft, mx		
Fanno Creek ( )	sd	sd, mx		
Beaverton Creek ( )	sd	sd, mx		
Yamhill River (8.0)	sd	sd, ft, mx		
South Yamhill River ( )				sd
Santiam River (0.5)	ft, fh			
Conser Slough (0.1)	ft, bio, fh	sd, ft, mx		
McKenzie River (1.0)			ft, ea	
Amazon Creek Drainage				sd
Middle Fork Willamette River (8.0)			sd, ft, ea	

LEGEND:

sd = Sediment Chemistry
ft = Fish Tissue Chemistry
bio = Sediment Bioassay
mx = Microtox
fh = Fish Health Assessment
ea = Enzyme Assay

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Table 2: Analysis Performed at Sediment Stations

Station (River Miles)	Year			
	1988	1989	1990	1991
Mainstem				
6	A B C E			
7	A B C E F	A B C E F	A B B' C	
8	A B E F	A B C E		
14		A B C E		
16	A B C E F			
18		A B C E F		
27	A B C E	A B C E F		
38	A B C E F	A B C E		
47		A B C E F		
48	A B C E			
52		A B C E F		
74		C	A B	
131			A B B' C	
145				D
147			A B B' C D	D
161			A B B' C	D
Tributary				
Columbia Slough	A B C E F	A B C E	A B B' C D	
Johnson Creek				A
Clackamas River	F			
Tualatin River	A B C E	A B C E		
Fanno Creek	A B C E	A B C E		
Beaverton Creek	A B C E	A B C E		
Yamhill River	A B E	A B E		
South Yamhill River				D
Conser Slough		A B C E		
Amazon Creek Drainage				D
Middle Fork Willamette River			A B B' C D	

LEGEND:

A = Chlorinated Pesticides
B = Aroclor PCBs
B' = Co-Planar BCBs
C = PAHs
D = Dioxins & Furans
E = Metals
F = Bioassays

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Table 3: Chemical Analysis Performed at Fish Tissue Stations

Station (River Miles)	Year			
	1988	1989	1990	1991
Mainstem				
7	A B D	A B D	A B	
18		A B D		
27	A B D			
28		A B D		
38	A B D	A B D		
48	A B D	A B D		
74		A B D	A B	
131			A B	
141				C
143			C	C
145			C	C
147			A B C	
161			A B	C
176			C	
Tributary				
Johnson Creek				A B D
Tualatin River		A B		
Yamhill River		A B		
Santiam River	B D			
Conser Slough	A B D	A B D		
McKenzie River			C	
MF Willamette River			A B C	

LEGEND:

A = Clorinated Pesticides
B = PCBs
C = Dioxins & Furans
D = Metals

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Table 4: Sediment Chemical Analysis Parameters

Chlorinated Pesticides		
a-BHC b-BHC d-BHC Lindane Heptachlor Heptachlor Epoxide Endosulfan I	Endosulfan II Endosulfan Sulfate Aldrin Dieldrin Endrin Endrin Aldelyde	p,p' DDE p,p'DDD p,p'DDT Methoxychlor Chlordane Toxaphene
Aroclor PCBs	**Co-Planar PCBs**	**Metals**
1221 1232 1242 1254 1260	3,3',4,4' Tetrachlorobiphenyl 2,3,3'4,4' Pentachlorobiphenyl 3,3'4,4',5 Pentachlorobiphenyl 3,3'4,4'5,5' Hexachlorobiphenyl	Arsenic Cadmium Chromium Copper Lead Mercury Zinc

Dioxins	Furans
2,3,7,8 Tetrachlordibenzo-p-dioxin 1,2,3,7,8 Pentachlorodibenzo-p-dioxin 1,2,3,4,7,8 Hexachlorodibenzo-p-dioxin 1,2,3,6,7,8 Hexachlorodibenzo-p-dioxin 1,2,3,7,8,9 Hexachlorodibenzo-p-dioxin 1,2,3,4,6,7,8 Heptachlorodibenzo-p-dioxin Octachlorodibenzo-p-dioxin	2,3,7,8 Tetrachlorodibenzofuran 1,2,3,7,8 Pentachlorodibenzofuran 2,3,4,7,8 Pentachlorodibenzofuran 1,2,3,4,7,8 Hexachlorodibenzofuran 1,2,3,6,7,8 Hexachlorodibenzofuran 2,3,4,6,7,8 Hexachlorodibenzofuran 1,2,3,7,8,9 Hexachlorodibenzofuran 1,2,3,4,6,7,8 Heptachlorodibenzofuran 1,2,3,4,7,8,9 Heptachlorodibenzofuran Octachlorodibenzofuran

Polycyclic Aromatic Hydrocarbons (PAHs)	
Naphthalene Azulene Acenaphthylene Dibenzofuran Fluorene Dibenzothiophene Acridine Phenanthrene Anthracene	Carbazole Fluoranthene Pyrene Retene Benzo(a)pyrene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Perylene

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Table 5: Fish Tissue Chemical Analysis Parameters

Parameter	Year			
	1988	1989	1990	1991
Chlorinated Pesticides				
a-BHC	X	X	X	
b-BHC	X	X	X	
d-BHC	–	X	X	
Lindane	X	X	X	
Heptachlor	X	X	X	
Heptachlor Epoxide	X	X	X	
Ensosulfan I	–	X	X	
Endosulfan II	–	X	X	
Endosulfan Sulfate	–	X	X	
Aldrin	X	X	X	
Dieldrin	X	X	X	
Endrin	X	X	X	
Endrin Aldehyde	–	X	X	
p,p' DDE	X	X	X	
p,p' DDD	X	X	X	
p,p' DDT	X	X	X	
Methoxychlor	X	X	X	
Chlordane	X	X	X	
Toxaphene	–	–	X	
PCBs				
Aroclor 1221	X	X	X	X
Araoclor 1232	X	X	X	X
Aroclor 1242	X	X	X	X
Aroclor 1254	X	X	X	X
Aroclor 1260	X	X	X	X
3,3',4,4' TCBP	–	–	–	X
2,3,3',4,4' PeCBP	–	–	–	X
3,3',4,4',5 PeCBP	–	–	–	X
3,3',4,4',5,5' HxCBP	–	–	–	X
Dioxins & Furans				
2,3,7,8 TCDD	–	–	X	X
1,2,3,7,8 PeCDD	–	–	X	X
1,2,3,4,7,8 HxCDD	–	–	X	X
1,2,3,6,7,8 HxCDD	–	–	X	X
1,2,3,7,8,9 HxCDD	–	–	X	X
1,2,3,4,5,6,7,8 HpCDD	–	–	X	X
OCDD	–	–	X	X
2,3,7,8 TCDF	–	–	X	X
1,2,3,7,8 PCCDF	–	–	X	X
2,3,4,7,8 PeCDF	–	–	X	X
1,2,3,4,7,8 HxCDF	–	–	X	X

Table 5: Fish Tissue Chemical Analysis Parameters *(Continued)*

Parameter	Year			
	1988	1989	1990	1991
1,2,3,6,7,8 HxCDF	—	—	X	X
2,3,4,6,7,8 HxCDF	—	—	X	X
1,2,3,7,8,9 HxCDF	—	—	X	X
1,2,3,4,6,7,8 HpCDF	—	—	X	X
1,2,3,4,7,8,9 HpCDF	—	—	X	X
OCDF	—	—	X	X
PAHs				
Naphthalene	X	X	X	—
Azulene	X	X	X	—
Acenaphthylene	X	X	X	—
Dibenzofuran	X	X	X	—
Fluorene	X	X	X	—
Dibenzothiophene	X	X	X	—
Acridine	X	X	X	—
Phenanthrene	X	X	X	—
Anthracene	X	X	X	—
Carbazole	X	X	X	—
Fluoranthene	X	X	X	—
Pyrene	X	X	X	—
Retene	X	X	X	—
Benzo(a)pyrene	X	X	X	—
Chrysene	X	X	X	—
Benzo(b)fluoranthene	X	X	X	—
Benzo(k)fluoranthene	X	X	X	—
Perylene	X	X	X	—
Metals				
Arsenic	X	X	—	X
Barium	—	—	—	X
Berylium	—	—	—	X
Cadmium	X	X	—	X
Chromium	X	X	—	X
Copper	X	X	—	X
Lead	X	X	—	X
Mercury	X	X	—	X
Selenium	—	—	—	X
Thallium	—	—	—	X
Zinc	X	X	—	X

LEGEND:

X = Sample analyzed for this chemical.
— = Sample not analyzed for this chemical.

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Table 6: Summary of Work

Waterbody	River Miles	Year	Media	Chemistry	Bulk & Elutriate Bioassaty	Microtox Bioassay	Fish Health Assessment	Enzyme Assays	Growth Assays
1988 – 1991 Analytical Results									
Willamette	6	88	sd	X					
	7	88, 89, 90	sd	X					
		88, 89	sd		X				
		89	sd			X			
		88, 89, 90	ft	X					
		88	ft				X		
		88, 89	ft						X
	8	88, 89	sd	X					
		89	sd			X			
	14	89	sd	X		X			
	16	88	sd	X	X				
	18	89	sd	X	X	X			
		89	ft	X					
	27	88, 89	sd	X					
		89	sd		X	X			
		88	ft	X					
	28	89	ft	X					
	38	88, 89	sd	X					
		88	sd		X				
		88, 89	ft	X					
		88, 89	ft				X		
	47	89	sd	X	X	X			
	48	88	sd	X					
		88, 89	ft	X					
		88, 89	ft				X		
	52	89	sd	X	X	X			
	74	90	sd	X					
		89, 90	ft	X					
		89	ft				X		
	131	90	sd	X					
		90	ft	X					
	141	91	ft	X					
	143	90, 91	ft	X				X	
	145	90	sd	X					
		90, 91	ft	X				X	

Table 6: Summary of Work *(Continued)*

Waterbody	River Miles	Year	Media	Chemistry	Bulk & Elutriate Bioassaty	Microtox Bioassay	Fish Health Assessment	Enzyme Assays	Growth Assays
Willamette *(Continued)*	147	90	sc	X					
		90	ft	X				X	
	161	90	sd	X					
		90, 91	ft	X					
	176	90	ft	X				X	
Columbia Slough	1	88, 89	sd	X					
		88	sd		X				
		89	sd			X			
Johnson Creek		91	sd	X					
		91	ft	X					
Clackamas	2	88	sd		X				
		88, 89	ft						X
Tualatin	8	88, 89	sd	X					
		89	sd			X			
			ft	X					
Fanno Creek	2	88, 89	sd	X					
		89	sd			X			
Beaverton Creek	4	88, 89	sd	X					
		89	sd			X			
Yamhill	5	88, 89	sd	X					
		89	sd			X			
			ft	X					
S. Yamhill Drainage		90	sd	X					
Santiam	0.5	88	ft	X			X		
Conser Slough	0.1	89	sd	X		X			
		88, 89	ft	X			X		
McKenzie	3	90	ft	X				X	
Amazon Creek Drainage		90	sd	X					
Mid Fork Willamette	8	90	sd	X					

LEGEND:

sd = Sediment
ft = Fish Tissue

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Table 7: Summary of Sediment Results — Organochorine Pesticide Analysis

Parameter	Number of Samples	Number of Detects	Minimum	Median	Maximum
Mainstem Willamette River: 1988 — 1990					
alpha-BHC	32	1		0.006	
beta-BHC	32	3	0.007	0.008	0.018
p,p' DDE	32	5	0.006	0.08	0.27
p,p' DDD	32	8	0.006	0.027	1.4
p,p' DDT	32	5	0.006	0.021	1.64
Tributaries to The Willamette River: 1988 — 1990					
Endrin Aldehyde	20	1		0.045	
p,p' DDE	20	11	0.003	0.018	0.13
p,p' DDD	20	10	0.002	0.015	0.069
p,p' DDT	20	8	0.002	0.051	0.51

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

SA\WH5543.5

Table 8: Summary of Sediment Results — PCB Analysis

Parameter	Number of Samples	Number of Detects	Minimum	Median	Maximum
Mainstem Willamette River: 1988 — 1990					
PCB 1254	32	2	0.250	2.225	4.200
PCB 1260	32	3	0.050	0.260	0.350
Tributaries to The Willamette River: 1988 — 1990					
PCB 1254	20	5	0.063	0.089	0.490
PCB 1260	20	2	0.010	0.185	0.360

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

SA\WH5544.5

Table 9: Summary of Sediment Results — PAH Analysis

Parameter	Number of Samples	Number of Detects	Minimum	Median	Maximum
Mainstem Willamette River: 1988 — 1990					
Naphthalene	29	11	0.008	0.130	30.200
Azulene	11	1		0.260	
Acenaphthylene	29	5	0.009	0.031	0.261
Acenaphthene	29	6	0.005	0.120	14.900
Dibenzofuran	23	6	0.025	0.075	11.400
Fluorene	29	5	0.065	0.104	16.100
Dibenzothiophene	15	2	0.120	1.640	3.160
Acridine	13	1		0.280	
Phananthrene	29	18	0.008	0.130	800.000
Anthracene	29	13	0.005	0.101	200.000
Fluoranthene	29	18	0.007	0.187	900.000
Pyrene	29	14	0.009	0.125	500.000
Retene	20	13	0.043	0.290	0.940
Benzo(a)anthracene	29	14	0.008	0.110	200.000
Chrysene	29	16	0.006	0.126	300.000
Benzo(b)fluoranthene	29	14	0.060	0.245	300.000
Benzo(k)fluoranthene	29	14	0.003	0.279	100.000
Perylene	13	2	0.070	0.610	1.150
Benzo(a)pyrene	29	11	0.007	0.215	300.000
Indeno(1,2,3-cd)pyrene	29	7	0.010	0.273	300.000
Dibenz(ah)anthracene	29	4	0.160	5.074	500.000
Benzo(ghi)perylene	29	7	0.110	0.410	200.000
Tributaries to The Willamette River: 1988 — 1990					
Naphthalene	16	5	0.016	0.036	19.000
Acenaphthylene	16	1		33.000	
Acenaphthene	16	2	0.009	16.505	33.000
Phenanthrene	16	9	0.021	0.099	0.890
Anthracene	16	5	0.001	0.008	0.120
Fluoranthene	16	10	0.020	0.093	0.950
Pyrene	16	7	0.025	0.116	0.800
Retene	9	6	0.106	0.150	0.582
Benzo(a)anthracene	16	6	0.007	0.047	0.560
Chrysene	16	9	0.009	0.032	0.510
Benzo(b)fluoranthene	16	8	0.054	0.130	1.200
Benzo(k)fluoranthene	16	8	0.004	0.049	0.370
Benzo(a)pyrene	16	5	0.009	0.032	0.890
Indeno(1,2,3-cd)pyrene	16	4	0.029	0.041	1.100
Dibenz(ah)anthracene	16	2	0.053	0.108	0.163
Benzo(ghi)perylene	16	3	0.110	0.274	2.300

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

SA\WH5545.5

Table 10: Summary of Sediment Results — Dioxin & Furan Analysis

Basin	Station	River Mile	Date	Lab	Analytical Method	Chemicals									
						TOC (mg/kg — Wet)	2,3,7,8 TCDD (ng/kg) — Wet)	1,2,3,7,8 PeCDD (ng/kg — Wet)	1,2,3,4,7,8 HxCDD (ng/kg — Wet)	1,2,3,6,7,8 HxCDD (ng/kg — Wet)	1,2,3,7,8,9 HxCDD (ng/kg — Wet)	1,2,3,4,6,7,8 HpCDD (ng/kg — Wet)	OCDD (ng/kg — Wet)	2,3,7,8 TCDF (ng/kg — Wet)	1,2,3,7,8 PeCDF (ng/kg — Wet)
1990 — 1992 Analytical Results															
Willamette	McFarland Site 1 (Amazon Cr. Drainage)		—	Alta	EPA 1613A	37000	10	54	93	300	170	6300	49000	2.2u	3.8u
	McFarland Site 2 (Amazon Cr. Drainage)		—	Alta	EPA 1613A	34600	4.2	15	18	53	21	920	7800	5.4u	2.9
	Baxter Site 3 (Amazon Cr. Drainage)		—	Alta	EPA 1613A	34400	43	480	1400	12000	2700	220000	1700000	98	320
	Taylor Site 4 (S. Yamhill)		—	Alta	EPA 1613A	8300	66	180	140	600	230	13000	100000	12	34
	Taylor Site 5 (S. Yamhill)		—	Alta	EPA 1613A	7900	23	82	260	1500	550	34000	280000	19	65
Mid Fork Willamette	Jasper (WR6A)	5	1990	Alta	EPA 1613A	6200	0.28u	0.68	1.1	3.1	1.4	53	450	0.39u	0.23
	Harrisburg	161	1991	Alta	EPA 1613A	13740	0.18u	0.29u	0.53u	1.6	1.2	22	130	0.26u	0.18u
	Halsey (WR4C)	147	1990	Alta	EPA 1613A	3200	0.42	2	3.8	26	8.2	540	5600	0.47u	0.96
			1991	Alta	EPA 1613A	7810	0.23u	0.25u	0.45u	0.71	0.38u	9.4	79	0.25u	0.16u
		145	1991	Alta	EPA 1613A	7590	0.2u	0.2u	0.39u	0.52	0.35u	6.7	49	0.19u	0.18u

LEGEND:

u = Material was analyzed for but not detected.

SA\WH5657.5

Table 11: Summary of Sediment Results — Metals Analysis

Parameter	Number of Samples	Number of Detects	Minimum	Median	Maximum
Mainstem Willamette River: 1988 — 1990					
Arsenic	19	19	2.330	4.990	45.50
Cadmium	19	10	0.007	0.170	0.90
Chromium	19	19	11.900	26.700	90.80
Copper	19	19	14.600	26.000	320.00
Lead	19	19	5.700	20.000	151.00
Mercury	19	16	0.018	0.034	1.74
Zinc	19	19	62.500	75.900	703.00
Tributaries to The Willamette River: 1988 — 1990					
Arsenic	13	14	2.800	4.410	29.60
Cadmium	13	12	0.160	0.500	4.50
Chromium	13	13	14.900	27.200	186.00
Copper	13	13	7.990	25.800	331.00
Lead	13	13	11.000	29.600	283.00
Mercury	13	12	0.014	0.049	0.30
Zinc	13	13	69.400	114.000	398.00

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

SA\WH5546.5

Table 12: Sediment Bioassay Results

Station	Test	Organism	% Survival
1988 Samples			
Clackamas R. @ River Mile 2	Elutriate	D. magna	100
Willamette R. @ River Mile 38	Elutriate	D. magna	100
Willamette R. @ River Mile 16	Elutriate	D. magna	100
Willamette R. @ River Mile 7	Elutriate	D. magna	100
Columbia Slough @ River Mile 1	Elutriate	D. magna	100
Columbia Slough @ River Mile 5	Elutriate	D. magna	100
Clackamas R. @ River Mile 2	Solid Phase	D. magna	93
		H. azteca	90
Willamette R. @ River Mile 38	Solid Phase	D. magna	80
		H. azteca	83
Willamette R. @ River Mile 16	Solid Phase	D. magna	93
		H. azteca	90
Willamette R. @ River Mile 7	Solid Phase	D. magna	100
		H. azteca	93
Columbia Slough @ River Mile 1	Solid Phase	D. magna	100
		H. azteca	97
Columbia Slough @ River Mile 5	Solid Phase	D. magna	100
		H. azteca	87
LEGEND: D. magna = Daphnia magna H. azteca = Hyallela azteca			

SA\WH5547.5

Table 13: Sediment Bioassay Results

Station	Test	Organism	% Survival
1989 Samples			
Audubon Pond (Control)	Solid Phase	D. magna	100
		C. riparius	90
Willamette R. @ River Mile 7	Solid Phase	D. magna	100
		C. riparius	75
Willamette R. @ River Mile 18	Solid Phase	D. magna	100
		C. riparius	65
Willamette R. @ River Mile 27	Solid Phase	D. magna	100
		C. riparius	70
Willamette R. @ River Mile 47	Solid Phase	D. magna	100
		C. riparius	100
Willamette R. @ River Mile 52	Solid Phase	D. magna	87

LEGEND:

D. magna = Daphnia magna C. riparius = Chironomus riparius

SA\WH5548.5

Table 14: Sediment Bioassay Results

Station	Test	EC50 (g/l)
Microtox 1989 Samples		
Willamette R. @ River Mile 7	Microtox	s
Willamette R. @ River Mile 7	Microtox	18
Willamette R. @ River Mile 8	Microtox	73
Willamette R. @ River Mile 14	Microtox	s
Willamette R. @ River Mile 18	Microtox	nt
Willamette R. @ River Mile 27	Microtox	32
Willamette R. @ River Mile 47	Microtox	659
Willamette R. @ River Mile 52	Microtox	863
Columbia Slough @ River Mile 1	Microtox	s
Tualatin R. @ River Mile 8	Microtox	nt
Fanno Creek @ River Mile 2	Microtox	344
Beaverton Creek @ River Mile 4	Microtox	36
Yamhill R. @ River Mile 5	Microtox	s
Conser Slough @ River Mile 0.5	Microtox	5

LEGEND:

s = Stimulatory effect.

nt = No toxicity exhibited.

EC50 = The effective concentration causing a 50% reduction in light output.

SA\WH5549.5

Table 15: Fish Health Assessment — Summary of Percent Normals

Station	Eyes	Gills	Pseudo-Branchs	Thymus	Spleen	Hind Gut	Kidney	Liver
1988 Sample Results								
Willamette River @ River Mile 7	100	53	0	60	100	100	93	73
Willamette River @ River Mile 38	100	53	0	60	100	88	93	73
Willamette River @ River Mile 47	92	31	0	54	92	100	92	31
Santiam River @ River Mile 0.5	95	68	100	79	100	100	100	37
Conser Slough @ River Mile 0.1	94	65	100	76	100	89	76	65
1989 Sample Results								
Willamette River @ River Mile 38	100	100	100	80	100	33	100	80
Willamette River @ River Mile 47	100	59	100	47	94	100	76	88
Willamette River @ River Mile 74	95	75	100	100	100	95	85	95
Willamette River @ River Mile 115	95	50	95	85	100	95	80	65

SA\WH5550.5

Table 16: Enzyme Induction — Whitefish Liver

Station	Variable	N	Minimum	Mean	Maximum	Standard Deviation
1990 Samples						
Willamette River @ River Mile 143	EROD	5	0.000500	0.006700	0.013000	0.004712
	AHH	5	0.010000	0.017400	0.030000	0.008414
Willamette River @ River Mile 145	EROD	5	0.000500	0.006500	0.023000	0.009605
	AHH	5	0.012000	0.028200	0.051000	0.017627
Willamette River @ River Mile 147	EROD	5	0.000500	0.004500	0.008000	0.002784
	AHH	5	0.010000	0.021400	0.035000	0.009154
Willamette River @ River Mile 176	EROD	5	0.000500	0.000800	0.001000	0.000274
	AHH	5	0.005000	0.015400	0.021000	0.007127
McKenzie River @ River Mile 3	EROD	5	0.001000	0.003600	0.005000	0.001673
	AHH	5	0.015000	0.021800	0.033000	0.007596
Mid Fork Willamette @ River Mile 8	EROD	5	0.000500	0.000600	0.001000	0.000224
	AHH	5	0.015000	0.019600	0.027000	0.005273

LEGEND:

Units = nmol/mg protein/min at 25 Celsius.

N = Number of Samples.

SA\WH5551.5

Table 17: Summary of Fish Tissue Results — Pesticide Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Levels	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mainstem Willamette River: 1988 — 1990									
alpha-BHC	66	6	0.004	0.004	0.039	0.004			
beta-BHC	66	4	0.002	0.005	0.006	0.007			
delta-BHC	60	7	0.002	0.003	0.005				
Lindane	66	4	0.002	0.018	0.045		0.1	0.1	0.51
Heptachlor	66	20	0.002	0.004	0.068	0.003	0.3	0.2	0.21
Heptachlor Epoxide	66	4	0.002	0.003	0.006		0.3	0.2	0.21
Endosulfan I	56	6	0.002	0.003	0.148	42.93			
Endosulfan Sulfate	56	3	0.002	0.019	0.026				
Aldrin	66	4	0.003	0.012	0.103	0.00037	0.3	0.12	0.022
Dieldrin	66	8	0.002	0.005	0.352	0.00036	0.3	0.12	0.022
Endrin	66	4	0.002	0.003	0.061		0.3	0.025	
Endrin Aldehyde	58	3	0.025	0.088	0.109				
p,p' DDE	66	41	0.004	0.023	0.266	0.0013	5	0.2	0.27
p,p' DDD	66	24	0.002	0.011	0.144	0.0013	5	0.2	0.27
p,p' DDT	66	12	0.005	0.010	0.216	0.0013	5	0.2	0.27
Methoxychlor	66	4	0.003	0.037	0.832				
Chlordane	66	1		0.025		0.0068	0.3	0.5	0.37
Toxaphene	35	1		0.025		0.0096	5		

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5552.5

Table 18: Fish Tissue Evaluation Values

Parameter	mg/kg – Wet Weight			
	EPA/TV	FDA Action Levels	NYS/DEC Wildlife Values Non-Carcinogenic	NYS/DEC Wildlife Values Carcinogenic
Antimony	45			
Arsenic	0.00077			
Beryllium	0.002223			
Chromium III	54928			
Mercury	1	1		
Nickel	4.7			
Thallium	5.712			
2,3,7,8-TCDD	0.00000007	0.000025	0.000003	0.0000023
Acrolein	167.7			
Acrylonitrile	0.0195			
Benzene	0.2084			
Carbon Tetrachloride	0.130125			
Chloroform	0.058875			
Dichloroethylenes	0.0103785			
Dichloropropene	26.931			
Ethylenebenzene	123			
Halomethanes	0.014287			
1,1,2,2-Tetrachlorethane	0.0535			
Tetrachloroethylene	0.27081			
Toluene	4.5368			
1,1,2-Trichloroethane	0.1881			
Trichloroethylene	0.85542			
Vinyl Chloride	0.61425			
2,4,6-Trichlorophenol	0.54			
Tetrachlorophenol			0.67	
Trichlorobenzenes			1.3	
Pentachlorophenol			2	
Benzidine	0.000046375			
Bis(2-Chloroethyl)Ether	0.009384			
Bis(2-Chloroisoprophyl)Ether	10.7692			
Dichlorobenzenes	144.56			
3,3'-Dichlorobenzidine	0.00624			

Table 18: Fish Tissue Evaluation Values *(Continued)*

Parameter	mg/kg – Wet Weight			
	EPA/TV	FDA Action Levels	NYS/DEC Wildlife Values Non-Carcinogenic	NYS/DEC Wildlife Values Carcinogenic
Dimethyl Phthalate	10440			
2,4-Dinitrotoluene	0.03458			
Dinitrotoluene	54.34			
Diphenylhydrazine	0.013944			
Fluoranthene	62.1			
Hexachlorobenzene	0.0064306			
Hexachlorobutadiene	0.139		1.3	4.5
Hexachloroethane	0.759506			
Isophorone	2277.6			
N-Nitrosodiphenylamine	2.1896			
Octachlorostyrene			0.02	
Aldrin	0.00036893	0.3	0.12	0.022
Benzene Hexachloride			0.33	0.2
Chlordane	0.006768	0.3	0.5	0.37
Chlordecone		0.3		
4,4'-DDT	0.0012864	5	0.2	0.27
Dieldrin	0.00035492	0.3	0.12	0.022
Endosulfan	42.93			
Endrin		0.3	0.025	
Heptachlor	0.003248	0.3	0.2	0.21
Heptachlor Epoxide		0.3	0.2	0.21
Hexachlorcyclohexane-alpha	0.00403			
Hexachlorcyclohexane-beta	0.007111			
Hexachlorcyclohexane-gamma	0.008125			
Hexachlorcyclohexane-Technical	0.005382			
Lindane		0.1	0.1	0.51
Hexachloroethane			14.1	
Mirex			0.33	0.37
PCB	0.0024648	2	0.11	
Toxaphene	0.009563	5		

SA\WH5554.5

Table 19: Summary of Fish Tissue Results — Pesticide Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Levels	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Tributaries to the Willamette River: 1988 — 1990									
beta-BHC	30	4	0.003	0.004	0.005	0.007			
Heptachlor	30	2	0.004	0.006	0.007	0.003	0.3	0.2	0.21
Dieldrin	30	2	0.004	0.004	0.004	0.0004	0.3	0.12	0.022
Endrin	30	3	0.002	0.004	0.004				
p,p'DDE	30	18	0.004	0.011	0.160	0.0013	5	0.2	0.27
p,p'DDD	30	6	0.003	0.005	0.048	0.0013	5	0.2	0.27
p,p'DDT	30	8	0.007	0.019	0.220	0.0013	5	0.2	0.27
Methoxychlor	30	2	0.003	0.003	0.003				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5555.5

Table 20: Summary of Fish Tissue Results — PCB Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Levels	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mainstem Willamette River: 1988 — 1990									
3,3'4,4'TCBP	34	12	0.002	0.003	0.037				
2,3,3'4,4'PeCBP	34	1		0.006					
3,3'4,4'5PeCBP	34	4	0.002	0.0055	0.021				
Arochlor 1242	66	1		0.119		0.0025	2	0.11	
Arochlor 1254	66	4	0.109	0.183	0.36	0.0025	2	0.11	
Arochlor 1260	66	15	0.015	0.058	1.403	0.0025	2	0.11	
Tributaries to the Willamette River: 1988 — 1990									
3,3'4,4'TCBP	6	4	0.003	0.007	0.011				
2,3,3'4,4'PeCBP	6	3	0.002	0.003	0.004				
3,3'4,4'5PeCBP	6	2	0.004	0.006	0.007				
Arochlor 1242	14	2	0.225	0.234	0.242	0.0025	2	0.11	
Arochlor 1254	14	1		0.132		0.0025	2	0.11	
Arochlor 1260	14	3	0.074	0.112	0.131	0.0025	2	0.11	

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5556.5

Table 21: Fish Tissue — Range & Median Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Guidance Levels	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mainstem Willamette River: 1988 — 1990									
TCDD	16	15	0.27	0.87	7.9	0.07	25	3	2.3
TCDF	16	16	0.41	3.35	30				
TEC	16	16	0.77	3.195	14.07	0.07	25	3	2.3

LEGEND:

Units = mg/kg-wet weight.

Median values were calculated from detectable values.

TCDD = 2,3,7,8 tetrachlorodibenzo-p-dioxin.

TCDF = 2,3,7,8 tetrachlorodibenzofuran.

TEC = Toxic Equivalency Concentration (calculated from detected values).

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5557.5

Table 22: Summary of Fish Tissue Results — Metals Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Levels	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mainstem Willamette River: 1988 — 1990									
Arsenic	25	1		0.100		0.00077			
Cadmium	25	2	0.020	0.020	0.020				
Chromium	25	1		0.040		54928 *			
Copper	25	25	0.130	0.270	0.780	-			
Lead	25	1		0.030					
Mercury	25	25	0.050	0.150	0.460	1	1		
Zinc	25	25	4.650	7.070	16.280				
Tributaries to the Willamette River: 1988 — 1990									
Barium	8	8	2.370	4.645	7.220				
Cadium	11	9	0.010	0.020	0.060				
Chromium	11	6	0.040	0.060	0.080	54928 *			
Copper	11	11	0.270	14.170	19.890				
Lead	11	6	0.050	0.085	0.180				
Mercury	11	11	0.030	0.100	0.490	1	1		
Zinc	11	11	5.210	17.720	19.870				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

* = Value for Cr III.

SA\WH5558.5

Table 23: Dioxin Analysis — Sediments

Basin	Station	River Mile	Date	Lab	Analytical Method	Chemicals																	
						TOC (mg/kg — Wet)	2,3,7,8 TCDD (ng/kg) — Wet)	1,2,3,7,8 PeCDD (ng/kg — Wet)	1,2,3,4,7,8 HxCDD (ng/kg — Wet)	1,2,3,6,7,8 HxCDD (ng/kg — Wet)	1,2,3,7,8,9 HxCDD (ng/kg — Wet)	1,2,3,4,6,7,8 HpCDD (ng/kg — Wet)	OCDD (ng/kg — Wet)	2,3,7,8 TCDF (ng/kg — Wet)	1,2,3,7,8 PeCDF (ng/kg — Wet)	2,3,4,7,8 PeCDF (ng/kg — Wet)	1,2,3,4,7,8 HxCDF (ng/kg — Wet)	1,2,3,6,7,8 HxCDF (ng/kg — Wet)	2,3,4,6,7,8 HxCDF (ng/kg — Wet)	1,2,3,7,8,9 HxCDF (ng/kg — Wet)	1,2,3,4,6,7,8 HpCDF (ng/kg — Wet)	1,2,3,4,7,8,9 HpCDF (ng/kg — Wet)	OCDF (ng/kg — Wet)
1990 — 1991 Analytical Results																							
Willamette	McFarland Site 1 (Amazon Cr. Drainage)		—	Alta	EPA 1613A	37000	10	54	93	300	170	6300	49000	2.2u	3.8u	26	3.2u	31u	75	9.1u	1400	77	3900
	McFarland Site 2 (Amazon Cr. Drainage)		—	Alta	EPA 1613A	34600	4.2	15	18	53	21	920	7800	5.4u	2.9	6.1	7.9	7.7	15	0.22u	170	0.22u	770
	Baxter Site 3 (Amazon Cr. Drainage)		—	Alta	EPA 1613A	34400	43	480	1400	12000	2700	220000	1700000	98	320	740	780	650	1100	690	16000	620	33000
	Taylor Site 4 (S. Yamhill)		—	Alta	EPA 1613A	8300	66	180	140	600	230	13000	100000	12	34	56	83	51	98	39	1400	560	3900
	Taylor Site 5 (S. Yamhill)		—	Alta	EPA 1613A	7900	23	82	260	1500	550	34000	280000	19	65	140	82u	82u	190	100	4200	180	3600
Mid Fork Willamette	Jasper (WR6A)	8	1990	Alta	EPA 1613A	6200	0.28u	0.68	1.1	3.1	1.4	53	450	0.39u	0.23	0.58	0.46	0.26	0.74	0.1u	6.8	0.056u	22
	Harrisburg	161	1991	Alta	EPA 1613A	13740	0.18u	0.29u	0.53u	1.6 -	1.2	22	130	0.26u	0.18u	0.35	0.45u	0.38u	0.62	0.23u	3.9	0.16u	9.1
	Halsey (WR4C)	147	1990	Alta	EPA 1613A	3200	0.42	2	3.8	26	8.2	540	5600	0.47u	0.96	2.1	3.6	1.8	3.7	0.12u	49	4.2	210
			1991	Alta	EPA 1613A	7810	0.23u	0.25u	0.45u	0.71	0.38u	9.4	79	0.25u	0.16u	0.16u	0.26u	0.19u	0.46	0.22u	2.3	0.17u	5.7
		145	1991	Alta	EPA 1613A	7590	0.2u	0.2u	0.39u	0.52	0.35u	6.7	49	0.19u	0.18u	0.17u	0.25u	0.2u	0.51	0.16u	1.6	0.16u	4.4

LEGEND:

u = Material was analyzed for but not detected.

SAIWIII5563 5A

Table 24: Oregon Interim Dredge Disposal Guidelines (IDG)

Physical Parameters:

The basic physical parameters and the numerical limits required for sediment quality assessment are as follows:

Parameter	Concentration
Grain Size	20% Silt
Organic Content	5% Volatile Solids
Oil & Grease	1,000 ppm

Exceedance of one of the numerical values requires additional chemical data for further assessment.

Chemical Parameters:

The basic chemical parameters required for sediment quality assessment are as follows. Additional parameters may need to be evaluated depending on historical information and best professional judgment. Additional parameters could include priority pollutants or chemicals of concern not listed on the priority pollutant list.

Parameter	Concentration (ppm)
Total Organic Carbon	(Required for evaluation of organic parameters)
Arsenic	40
Cadmium	1
Chromium	20 – 300
Copper	50
Mercury	0.15
Lead	40
Zinc	250
Aldrin	(EQP)
Chlordane	(EQP)
DDT, DD, DDE	0.2
Methoxychlor	(EQP)
2,4-D	(EQP)
Heptachlor	(EQP)
Lindane	EQP)
Acenaphthene	(EQP)
Phenanthrene	(EQP)
Total PCB's	0.5
EQP = Numerical value should be calculated from the USEPA Interim Sediment Criteria for Nonpolar Hydrophobic Organic Contaminants.	

Table 24: Oregon Interim Dredge Disposal Guidelines (IDG) *(Continued)*

Chemical parameters exceeding the guideline chemical concentrations will be regarded as having the potential for adversely affecting water quality. Toxicological data could be used for further assessment of sediment quality and the potential affects on water quality.

Where the natural quality of sediment for the waterbody exceed the guideline numerical limit for a metals parameter, the natural sediment quality shall be the guideline numerical limit. A natural sediment quality guidelines for a waterbody will be applicable only for that specific waterbody.

Best professional judgment is required when evaluating chemistry data.

Toxicological:

Bioassays can be used for further evaluation of sediment quality when chemistry values exceeds the guideline numerical values.

The types of bioassays that could be required for further assessment are as follows:

1. Acute Toxicity Bioassays.
2. Chronic Toxicity Bioassays.
3. Bioaccumulation Testing.

SA\WH5565.5

Table 25: Sediment Metals Concentrations

River	Station	River Mile	Date	Metals (mg/kg)						
				Total Arsenic	Total Cadmium	Total Chromium	Total Copper	Total Lead	Total Mercury	Total Zinc
1988 — 1989 Analytical Results										
Willamette	St. John's Bridge	6	10-Aug-88	45.5	0.9	43.2	47.5	35.7	0.03	159
	SP&S Bridge	7 North	26-Oct-89	4.47	0.07j	11.9	15.7	19j	0.034	75.9
		7 South	26-Oct-89	4.99	0.16j	22	19.2	23.5	0.087	87
			15-Aug-88	18.6	0.5u	20.4	31.1	33.9	0.03	121
	Doane Lake	7	10-Aug-88	54	0.5u	32.9	53.9	25.2	0.13	160
	Swan Island	8	26-Oct-89	5.39	0.617	27.5	197	35.1	0.092	214
		8,1A	26-Jan-88	3.9	0.5u	31.1	89.1	20.6	0.106	231
		8,1B	26-Jan-88	4.6	0.5u	38.8	101	30.5	0.139	272
		8,2A	26-Jan-88	14.5	0.5u	90.8	320	151	1.74	703
	Ross Island	14	26-Oct-89	2.33.	0.092j	18.9	14.6	12.4	0.033	73.2
	Sellwood Bridge	16	15-Aug-88	14.8	0.5u	25.3	32.3	22.8	0.03	107
	Johnson Creek	18	26-Oct-89	2.98	0.13j	26.7	20.6	20j	0.03	72.3
	DS Oregon City	27	25-Oct-89	3.73	0.19j	32.9	25.6	8.5j	0.034	75.6
			10-Aug-88	42.6	0.5u	26	28	5.7	0.008u	70.5
	Wilsonville	38	04-Oct-89	2.62	0.19j	28.2	26	11j	0.028	71.8
			15-Aug-88	18	0.5u	20.6	23.4	13.6	0.008u	72.6
	Newberg Pool	47	25-Oct-89	2.97	0.12j	28.5	23.7	13j	0.018	63.8
	Newberg	48	15-Aug-88	19.7	0.5u	17.6	20.6	11.1	0.008u	62.5
	US Newberg Pool	52	25-Oct-89	3.16	0.18j	24.6	22.6	9.9j	0.034	67.6
Columbia Slough	BL Mouth of North Slough	1	26-Oct-89	4.41	0.285	14.9	7.99	16j	0.031	69.4
			15-Aug-88	21.2	1.4	38.9	44.7	60	0.05	187
	Dump Road	2	15-Aug-88	13	0.5	19.4	19.5	52.6	0.05	142
	Denver Avenue	5	15-Aug-88	26.6	2.1	61.4	65.8	118	0.1	324
Tualatin	Tualatin	8	27-Oct-89	3.98	0.54	31.5	21	21.6j	0.048	109
			14-Nov-88	2.8	0.5	19.2	30.5	28	0.014	86.4
Fanno Creek	—	2	15-Nov-89	3.86	0.592	21.2	17.7	29.6	0.041	149
			09-Nov-88	3.4	0.5	22.2	19.4	36	0.015	148
Beaverton Creek	—	4	15-Nov-89	8.77	4.5J	186	331	283	0.3	398
			09-Nov-88	3.1	0.5	32.7	47.8	50.7	0.062	114
Yamhill	—	5	27-Oct-89	5.25	0.234	29.8	25.8	11j	0.018	80.3
			15-Aug-88	29.6	0.5u	27.2	39.4	17.1	0.008u	87
Conser Slough	—	0.1	05-Oct-89	3.39	0.16j	25.3	20.5	15j	0.065	74.7

LEGEND:

u = Material was analyzed for but not detected.
j = Estimated value; value not accurate.

SA\WII5566.5A (03/94)

Table 26: Willamette River Tributaries Concentrations for Pesticides in Sediment

River	River Mile	Sample Date	Chemicals (mg/kg)							
			Endrin Aldehyde	p,p' DDE	p,p' DDD	p,p' DDT	Methoxychlor	Chlordane	Toxaphene	TOC (Wet)
1988 – 1991 Analytical Results										
Johnson Creek	1.1	06-Feb-91	0.0063u	0.0063u	0.0063u	0.023	0.013u	0.063u	0.16u	N/A
	5.8	06-Feb-91	0.0063u	0.018	0.011	0.075	0.013u	0.063u	0.16u	N/A
	16.2	06-Feb-91	0.045	0.13	0.069	0.51	0.013u	0.063u	0.16u	N/A
	17.5	06-Feb-91	0.0063u	0.025	0.014	0.067	0.013u	0.063u	0.16u	N/A
Columbia Slough	1	26-Oct-89	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.14u	2000
		15-Aug-88	0.004u	0.014	0.019	0.004u	N/A	0.004u	0.06u	46700
		31-Aug-90								8220
		31-Aug-90								7650
		31-Aug-90								960
	2	15-Aug-88	0.002u	0.003	0.012	0.002u	N/A	0.002u	0.03u	19600
	5	15-Aug-88	0.005u	0.021	0.033	0.005u	N/A	0.005u	0.072u	70600
Tualatin River	8	27-Oct-89	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.15u	21000
		14-Nov-88	0.003u	0.006	0.003m	0.003u	N/A	0.003u	0.039u	
Fanno Creek	2	15-Nov-89	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.18u	
		09-Nov-88	0.002u	0.006	0.002m	0.002m	N/A	0.002u	0.033u	
Beaverton Creek	4	15-Nov-89	0.009u	0.046j	0.028j	0.034j	0.009u	0.009u	0.27u	
		09-Nov-88	0.002u	0.005	0.016	0.002	N/A	0.002u	0.03u	
Yamhill River	5	27-Oct-89	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.14u	3000
		15-Aug-88	0.002u	0.002u	0.002u	0.002u	N/A	0.002u	0.036u	41100
Conser Slough	0.1	05-Oct-89	0.006u	0.014j	0.006u	0.013j	0.006u	0.006u	0.18u	19000

LEGEND:

u = Not detected at the detection level indicated.
j = Estimated value; value not accurate.
N/A = Not Analyzed.

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Table 27: Willamette River Tributaries — PAH Concentrations in Sediment

River	River Mile	Sample Date	Chemicals (mg/kg)																
			Naphthalene	Acenaphthylene	Acenaphthene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Retene	Benzo(a) Anthracene	Chrysene	Benzo(b) Fluoranthene	Benzo(k) Fluoranthene	Benzo(a) Pyrene	Indene (1,2,3-cd) Pyrene	Dibenz(ah) Anthracene	Benzo(ghi) Perylene	TOC (Wet)
1988 – 1990 Analytical Results																			
Mid Fork Willamette	8	24 Aug 90	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.15	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	5160
		24 Aug 90	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	6940
		24 Aug 90	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.15	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	1720
Columbia Slough	1	26 Oct 89	0.033J	0.273u	0.273u	0.0498J	0.273u	0.0535J	0.0558J	0.273u	0.273u	0.102J	0.0715J	0.0575J	0.273u	0.273u	0.273u	0.273u	2000
		15 Aug 88	37u	64u	64u	0.89	0.11J	1.1u	3.2u	N/A	0.53u	0.53u	0.93	0.24	0.53J	1.1u	2.1u	2.1u	46700
	2	15 Aug 88	19	33	33	0.32	0.12	0.95	1.7u	N/A	0.56	0.51	1.2	0.37	0.89	1.1	1.1u	2.3	19600
	5	15 Aug 88	42u	71u	71u	0.59u	0.12u	1.2u	3.6u	N/A	0.59u	0.59u	0.76	0.19	0.59u	1.2u	2.4u	2.4u	70600
Tualatin	8	27 Oct 89	0.34u	0.34u	0.34u	0.0402J	0.34u	0.132J	0.14J	0.122J	0.0344J	0.0694J	0.34u	0.34u	0.34u	0.34u	0.34u	0.34u	21000
		14 Nov 88	0.89u	1.5u	1.5u	0.099J	0.0076J	0.099J	0.076J	N/A	0.013u	0.025J	0.14J	0.041J	0.013u	0.025u	0.053J	0.051u	
Fanno Creek	2	15 Nov 89	0.371u	0.371u	0.371u	0.371u	0.371u	0.371u	0.063u	0.192J	0.371u	0.371u	0.371u	0.371u	0.371u	0.371u	0.371u	0.371u	
		09 Nov 88	0.75u	1.3u	1.3u	0.19	0.0043	0.56	0.8	N/A	0.065	0.032	0.12	0.024	0.032	0.052	0.043u	0.11	
Beaverton Creek	4	15 Nov 89	0.0357J	0.582u	0.582u	0.122J	0.582u	0.235J	0.361J	0.582u	0.06J	0.188J	0.582u	0.582u	0.582u	0.224J	0.163J	0.274J	
		09 Nov 88	0.67u	1.2u	1.2u	0.021	0.002u	0.044	0.058u	N/A	0.0096J	0.0096J	0.054	0.012	0.017	0.029	0.038u	0.038u	
Yamhill	5	27 Oct 89	0.0156J	0.282u	0.282u	0.282u	0.282u	0.028J	0.0245J	0.414	0.282u	0.282u	0.282u	0.282u	0.282u	0.282u	0.282u	0.282u	3000
		15 Aug 88	0.4u	0.69u	0.69u	0.01u	0.001J	0.02	0.04u	N/A	0.007	0.009	0.09	0.004	0.009	0.01u	0.02u	0.02u	41100
Conser Slough	0.1	05 Oct 89	0.0443J	0.355u	0.0093J	0.0934J	0.355u	0.0865J	0.116J	0.106J	0.355u	0.0213J	0.355u	0.355u	0.355u	0.355u	0.355u	0.355u	19000

LEGEND:

N/A = Not analyzed.
u = Not detected at the detection.
J = Estimated value.

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Table 28: Pesticides Detected in Sediment at Bioassay Stations

River	Station	River Mile	Sample Date	Chemicals (mg/kg)											
				Naphthalene	Azulene	Acenaphthylene	Acenaphthene	Dibenzofuran	Fluorene	Dibenzothiophene	Acridine	Phenanthrene	Anthracene	Carbazole	Fluoranthene
1988 – 1990 Analytical Results															
Willamette	SP&S Bridge	7 North	26-Oct-89	0.13j	N/A	0.261u	0.023j	0.0246j	0.261u	N/A	N/A	0.0696j	0.0287j	0.261u	0.134
		7 South	26-Oct-89	0.32j	N/A	0.0311j	0.0718j	0.0345j	0.0645j	N/A	N/A	0.506j	0.101j	0.3u	0.88
			15-Aug-88	26u	N/A	45u	45u	N/A	5.3u	N/A	N/A	0.9	0.32	N/A	2.6
	Doane Lake	7	10-Aug-88	2,000u	N/A	4,000u	4,000u	N/A	500u	N/A	N/A	800	200	N/A	900
	Sellwood Bridge	16	15-Aug-88	0.52u	N/A	0.89u	0.89u	N/A	0.1u	N/A	N/A	0.19	0.03	N/A	0.24
	Johnson Creek	18	26-Oct-89	0.0297j	N/A	0.298u	0.298u	0.298u	0.298u	N/A	N/A	0.0256j	0.298u	0.298u	0.0559
	DS Oregon City	27	25-Oct-89	0.0423j	N/A	0.381u	0.381u	0.381u	0.381u	N/A	N/A	0.0412j	0.381u	0.381u	0.0854
	Wilsonville	38	15-Aug-88	0.44u	N/A	0.76u	0.76u	N/A	0.09u	N/A	N/A	0.03	0.005	N/A	0.04
	Newberg Pool	47	25-Oct-89	0.0525j	N/A	0.0126j	0.355u	0.355u	0.355u	N/A	N/A	0.0373j	0.355u	0.355u	0.0381
	US Newberg Pool	52	25-Oct-89	0.511u	N/A	0.511u	0.511u	0.511u	0.511u	N/A	N/A	0.511u	0.511u	0.511u	0.511
Columbia Slough	Bl. Mouth of North Slough	1	15-Aug-88	37u	N/A	64u	64u	N/A	7.5u	N/A	N/A	0.89	0.11u	N/A	1.1
	Dump Road	2	15-Aug-88	19	N/A	33	33	N/A	3.9u	N/A	N/A	0.52	0.12	N/A	0.95
	Denver Avenue	5	15-Aug-88	42u	N/A	71u	71u	N/A	8.3u	N/A	N/A	0.59u	0.12u	N/A	1.2

LEGEND:

N/A = Not analyzed.
u = Not detected at the detection.
j = Estimated value; value not accurate.

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Table 29: Chlorinated Pesticides Detected in Sediment at Bioassay Stations

River	Station	River Mile	Sample Date	Chemicals (mg/kg)			
				pp,p' DDE	p,p' DDD	p,p'DDT	TOC (wet)
1989 Analytical Results							
Willamette	SP&S Bridge	7 North	26-Oct-89	0.004u	0.004u	0.004u	5,000
		7 South	26-Oct-89	0.08j	0.8j	1.64j	12,000
	Swan Island	8	26-Oct-89	0.014j	0.019j	0.019j	80,000
	Johnson Creek	18	26-Oct-89	0.005u	0.005u	0.005u	22,000
	DS Oregon City	27	25-Oct-89	0.006u	0.006u	0.006u	
	Newberg Pool	47	25-Oct-89	0.006u	0.006u	0.006u	29,000
	US Newberg Pool	52	25-Oct-89	0.008u	0.008u	0.008u	45,000
1988 Analytical Results							
Willamette	SP&S Bridge	7	15-Aug-88	0.084	0.49	0.16	4,1900
	Doane Lake	7	10-Aug-88	0.27	1.4	0.021	29,900
	Swan Island	8,1A	26-Jan-88	0.018u	0.018u	0.018u	
		8,1B	26-Jan-88	0.012n	0.018u	0.016u	
		8,2a	26-Jan-88	0.04u	0.04u	0.04u	
	Sellwood Bridge	16	15-Aug-88	0.003u	0.003u	0.003u	37,900
	Wilsonville	38	15-Aug-88	0.003u	0.003u	0.003u	6,100
Columbia Slough	Near N. Slough	1	15-Aug-88	0.014	0.019	0.004u	46,700
	Dump Road	2	15-Aug-88	0.003	0.012	0.002u	19,600
	Denver Avenue	5	15-Aug-88	0.021	0.033	0.005u	70,600

LEGEND:

u = Material was analyzed for but not detected.
j = Estimated value; value not accurate.

SA\WH5503.5 (11/93)

Table 30: PCBs Detected in Sediment at Bioassay Stations

River	Station	River Mile	Sample Date	Chemicals (mg/kg)									
				3,3',4,4' TCBP	2,3,3',4,4' PCBP	3,3',4,4'5 PCBP	3,3',4,4',5,5' HCBP	PCB1 (1221)	PCB2 (1232)	PCB3 (1242)	PCB4 (1254)	PCB5 (1260)	TOC1 (Wet)
1988 – 1990 Analytical Results													
Willamette	SP&S Bridge	7 North	26-Oct-89	N/A	N/A	N/A	N/A	0.04u	0.04u	0.04u	0.04u	0.04u	5,000
		7 South	26-Oct-89	N/A	N/A	N/A	N/A	0.12u	0.12u	0.12u	0.12u	0.12u	12,000
			15-Aug-88	N/A	N/A	N/A	N/A	0.015u	0.015u	0.015u	0.015u	0.015u	41,900
	Doane Lake	7	10-Aug-88	N/A	N/A	N/A	N/A	0.06u	0.06u	0.06u	0.06u	0.05	29,900
	Swan Island	8,1A	26-Jan-88	N/A	N/A	N/A	N/A	0.05u	0.05u	0.05u	0.05u	0.26	
		8,1B	26-Jan-88	N/A	N/A	N/A	N/A	0.05u	0.05u	0.05u	0.05u	0.05u	
		8,2A	26-Jan-88	N/A	N/A	N/A	N/A	0.2u	0.2u	0.2u	4.2	0.2u	
	Sellwood Bridge	16	15-Aug-88	N/A	N/A	N/A	N/A	0.015u	0.015u	0.015u	0.015u	0.015u	37,900
	Johnson Creek	18	26-Oct-89	N/A	N/A	N/A	N/A	0.05u	0.05	0.05u	0.05u	0.05u	22,000
	DS Oregon City	27	25-Oct-89	N/A	N/A	N/A	N/A	0.062u	0.062u	0.062u	0.062u	0.062u	
	Wilsonville	38	15-Aug-88	N/A	N/A	N/A	N/A	0.013u	0.013u	0.013u	0.013u	0.013u	6,100
	Newberg Pool	47	25-Oct-89	N/A	N/A	N/A	N/A	0.06u	0.06u	0.06u	0.06u	0.06u	29,000
	US Newberg Pool	52	25-Oct-89	N/A	N/A	N/A	N/A	0.08u	0.08u	0.08u	0.08u	0.08u	49,000
Columbia Slough	Bl. Mouth of North Slough	1	15-Aug-88	N/A	N/A	N/A	N/A	0.02u	0.02u	0.02u	0.075	0.02u	46,700
	Dump Road	2	15-Aug-88	N/A	N/A	N/A	N/A	0.01u	0.01u	0.01u	0.089	0.01	19,600
	Denver Avenue	5	15-Aug-88	N/A	N/A	N/A	N/A	0.024u	0.024u	0.024u	0.14	0.024u	70,600

LEGEND:

N/A = Not analyzed.
u = Material was analyzed for but not detected.

SA\WH5535.5 (11/93)

Table 31: PAHs Detected in Sediment at Bioassay Stations

River	Station	River Mile	Sample Date	Chemicals (mg/kg)											
				Naphthalene	Acenaphathylene	Acenaphthene	Dibenzofuran	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Retene	Benzo(a) Anthracene	Chrysene
1989 Analytical Results															
Willamette	SP&S Bridge	7 North	26-Oct-89	0.13j	0.261u	0.023J	0.0246j	0.261u	0.0696j	0.0287j	0.134j	0.11j	0.0431j	0.0372j	0.0715
		7 South	26-Oct-89	0.324j	0.0311j	0.0718j	0.0345j	0.0645j	0.506j	0.101j	0.88	0.788	0.662	0.23j	0.345
	DS Oregon City	27	25-Oct-89	0.0423j	0.381u	0.381u	0.381u	0.381u	0.412j	0.381u	0.0854j	0.074j	0.29j	0.0217j	0.039
	Newberg Pool	47	25-Oct-89	0.0525j	0.0126j	0.355u	0.355u	0.355u	0.0373j	0.355u	0.0381j	0.048j	0.632j	0.355u	0.0166
	US Newberg Pool	52	25-Oct-89	0.511u	0.511u	0.511u	0.511u	0.511u	0.511u	0.511u	0.511u	0.048j	0.836j	0.511u	0.511
1988 Analytical Results															
Willamette	SP&S Bridge	7	15-Aug-88	26u	45u	45u	N/A	5.3u	0.9	0.32	2.6	2.3u	N/A	1.1	1.3
	Doane Lake	7	10-Aug-88	2,000u	4,000u	4,000u	N/A	500u	800	200	900	500	N/A	200	300
	Sellwood Bridge	16	15-Aug-88	0.52u	0.89u	0.89u	N/A	0.1u	0.19	0.03	0.24	0.14	N/A	0.05	0.03
	Johnson Creek	18	26-Oct-88	0.0297j	0.298u	0.298u	0.298u	0.298u	0.0256j	0.298u	0.0559j	0.0677j	0.151j	0.0233j	0.043
	Wilsonville	38	15-Aug-88	0.44u	0.76u	0.76u	N/A	0.09u	0.03	0.005	0.04	0.04u	N/A	0.008	0.006
Columbia Slough	Bl. Mouth of North Slough	1	15-Aug-88	37u	64u	64u	N/A	7.5u	0.89	0.11j	1.1u	3.2u	N/A	0.53u	0.53
	Dump Road	2	15-Aug-88	19	33	33	N/A	3.9u	0.52	0.12	0.95	1.7u	N/A	0.56	0.51
	Denver Avenue	5	15-Aug-88	42u	71u	71u	N/A	8.3u	0.59u	0.12u	1.2u	3.6u	N/A	0.59u	0.59

LEGEND:

u = Material was analyzed for but not detected.
j = Estimated value; value not accurate.

SA\WH5504.5 (11/93)

Table 32: Metals Detected in Sediment at Bioassay Stations

River	Station	River Mile	Sample Date	Total (mg/kg)						
				Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Zinc
1988 – 1990 Analytical Results										
Willamette	SP&S Bridge	7 North	26-Oct-89	4.47	0.07j	11.9	15.7	19j	0.034	75.9
		7 South	26-Oct-89	4.99	0.16j	22	19.2	23.5	0.087	87
			15-Aug-88	18.6	0.5u	20.4	31.1	33.9	0.03	121
	Doane Lake	7	10-Aug-88	54	0.5u	32.9	53.9	25.2	0.13	160
	Swan Island	8,1A	26-Jan-88	3.9	0.5u	31.1	89.1	20.6	0.106	231
		8,1B	26-Jan-88	4.6	0.5u	38.8	101	30.5	0.139	272
		8,2A	26-Jan-88	14.5	0.5u	90.8	320	151	1.74	703
	Sellwood Bridge	16	15-Aug-88	14.8	0.5u	25.3	32.3	22.8	0.03	107
	Johnson Creek	18	26-Oct-89	2.98	0.13j	26.7	20.6	20j	0.03	72.3
	DS Oregon City	27	25-Oct-89	3.73	0.19j	32.9	25.6	8.5j	0.034	75.6
	Wilsonville	38	15-Aug-88	18	0.5u	20.6	23.4	13.6	0.008u	72.6
	Newberg Pool	47	25-Oct-89	2.97	0.12j	28.5	23.7	13j	0.018	63.8
	US Newberg Pool	52	25-Oct-89	3.16	0.18j	24.6	22.6	9.9j	0.034	67.6
Columbia Slough	Bl. Mouth of North Slough		15-Aug-88	21.2	1.4	38.9	44.7	60	0.05	187
	Dump Road	2	15-Aug-88	13	0.5	19.4	19.5	52.6	0.05	142
	Denver Avenue	5	15-Aug-88	26.6	2.1	61.4	65.8	118	0.1	324

LEGEND:

u = Material was analyzed for but not detected.
j = Estimated value; value not accurate.

SA\WH5505.5 (11/93)

Table 33: Summary of Carp Results — Pesticide Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Levels	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mainstem Willamette River									
alpha-BHC	34	5	0.004	0.004	0.039	0.004			
beta-BHC	34	2	0.003	0.005	0.006	0.007			
delta-BHC	27	4	0.002	0.003	0.005				
Lindane	34	4	0.002	0.018	0.045		0.1	0.1	0.51
Heptachlor	34	9	0.002	0.005	0.068	0.003	0.3	0.2	0.21
Heptachlor Epoxide	34	2	0.002	0.005	0.006		0.3	0.2	0.21
Endosulfan I	28	2	0.004	0.076	0.148	42.93			
Endosulfan Sulfate	28	2	0.019	0.023	0.026				
Aldrin	34	2	0.020	0.062	0.103	0.00037	0.3	0.12	0.022
Dieldrin	34	4	0.006	0.048	0.352	0.00036	0.3	0.12	0.022
Endrin	34	1		0.061			0.3	0.025	
p,p' DDE	34	27	0.004	0.032	0.266	0.0013	5	0.2	0.27
p,p' DDD	34	18	0.004	0.016	0.144	0.0013	5	0.2	0.27
p,p' DDT	34	10	0.005	0.012	0.216	0.0013	5	0.2	0.27
Methoxychlor	34	3	0.003	0.069	0.832				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5569.5A

Table 34: Summary of Carp and Cutthroat Trout Results — Pesticide Analysis

Parameter	Species	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Levels	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
		Samples	Detects							
	Mainstem Willamette River									
alpha-BHC	Carp	34	5	0.004	0.004	0.039	0.004			
beta-BHC	Carp	34	2	0.003	0.005	0.006	0.007			
delta-BHC	Carp	27	4	0.002	0.003	0.005				
Lindane	Carp	34	4	0.002	0.018	0.045		0.1	0.1	0.51
Heptachlor	Carp	34	9	0.002	0.005	0.068	0.003	0.3	0.2	0.21
Heptachlor Epoxide	Carp	34	2	0.002	0.005	0.006		0.3	0.2	0.21
Endosulfan I	Carp	28	2	0.004	0.076	0.148	42.93			
Endosulfan Sulfate	Carp	28	2	0.019	0.023	0.026				
Aldrin	Carp	34	2	0.020	0.062	0.103	0.00037	0.3	0.12	0.022
Dieldrin	Carp	34	4	0.006	0.048	0.352	0.00036	0.3	0.12	0.022
Endrin	Carp	34	1		0.061			0.3	0.025	
p,p' DDE	Carp	34	27	0.004	0.032	0.266	0.0013	5	0.2	0.27
p,p' DDD	Carp	34	18	0.004	0.016	0.144	0.0013	5	0.2	0.27
p,p' DDT	Carp	34	10	0.005	0.012	0.216	0.0013	5	0.2	0.27
Methoxychlor	Carp	34	3	0.003	0.069	0.832				
delta-BHC	Cut Throat	10	3	0.002	0.003	0.006				
Heptachlor	Cut Throat	10	8	0.002	0.004	0.008	0.003	0.3	0.2	0.21
Endosulfan I	Cut Throat	10	3	0.002	0.002	0.003	42.93			
Aldrin	Cut Throat	10	1		0.003		0.00037	0.3	0.12	0.022
Dieldrin	Cut Throat	10	4	0.002	0.002	0.003	0.00036	0.3	0.12	0.022
Endrin	Cut Throat	10	3	0.002	0.002	0.002		0.3	0.025	
p,p' DDE	Cut Throat	10	2	0.006	0.018	0.023	0.0013	5	0.2	0.27
p,p' DDD	Cut Throat	10	2	0.002	0.003	0.003	0.0013	5	0.2	0.27
p,p' DDT	Cut Throat	10	2	0.005	0.006	0.007	0.0013	5	0.2	0.27

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5735.5

Table 35: Summary of Whitefish Results — TCDD, TCDF, TEC Range & Medians

Parameter	Location	Number of		Minimum	Median	Maximum	EPA/TV	FDA Guidance Value	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
		Samples	Detects							
1990 — 1991										
TCDD	US RM 147	5	4	0.27	0.53	0.87	0.07	25	3.0	2.3
	DS RM 147	7	7	1.4	2.7	7.9	0.07	25	3.0	2.3
TCDF	US RM 147	5	5	1.7	2.55	4				
	DS RM 147	7	7	4.6	13	22				
TEC	US RM 147	5	5	0.21	1.24	3	0.07	25	3.0	2.3
	DS RM 147	7	7	2.18	4.01	10.9	0.07	25	3.0	2.3

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.
NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.
TCDD = 2,3,7,8 tetrachlorodibenzo-p-dioxin.
TCDF = 2,3,7,8 tetrachlorodibenzofuran.
TEC = Toxic Equivalency Concentration (calculated form detected values).
US RM 147 = Upstream of rive mile 147 of the mainstem Willamette River.
DS RM 147 = Downstream of river mile 147 of the mainstem Willamette River.

SA\WH5597.5A

Table 36: Summary of Whitefish Results — TCDD, TCDF, TEC Range & Medians

Parameter	Location	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
		Samples	Detects							
1990										
TCDD	US RM 147	4	3	0.49	0.57	0.87	0.07	25	3.0	2.3
	DS RM 147	4	4	2.7	3.7	7.9	0.07	25	3.0	2.3
TCDF	US RM 147	4	4	2.1	2.55	4				
	DS RM 147	4	4	13	17.5	30				
TEC	US RM 147	4	4	0.21	1.7	3	0.07	25	3.0	2.3
	DS RM 147	4	4	4.01	6.27	10.9	0.07	25	3.0	2.3
1991										
TCDD	US RM 147	1	1		0.27		0.07	25	3.0	2.3
	DS RM 147	3	3	1.4	1.9	2.5	0.07	25	3.0	2.3
TCDF	US RM 147	1	1		1.7					
	DS RM 147	3	3	4.6	6.6	8.3				
TEC	US RM 147	1	1		0.77		0.07	25	3.0	2.3
	DS RM 147	3	3	2.18	3.04	3.85	0.07	25	3.0	2.3

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.
NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.
TCDD = 2,3,7,8 tetrachlorodibenzo-p-dioxin.
TCDF = 2,3,7,8 tetrachlorodibenzofuran.
TEC = Toxic Equivalency Concentration (calculated form detected values).
US RM 147 = Upstream of rive mile 147 of the mainstem Willamette River.
DS RM 147 = Downstream of river mile 147 of the mainstem Willamette River.

SA\WH5598.5

Table 37: Summary of Carp Results — TCDD, TCDF, TEC Range & Medians

Parameter	Location	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
		Samples	Detects							
TCDD	US RM 147	1	1		0.41		0.07	25	3.0	2.3
	DS RM 147	3	3	0.44	0.45	0.57	0.07	25	3.0	2.3
TCDF	US RM 147	1	1		0.41					
	DS RM 147	3	3	0.45	0.54	0.56				
TEC	US RM 147	1	1		1.39		0.07	25	3.0	2.3
	DS RM 147	3	3	0.78	0.93	1.02	0.07	25	3.0	2.3

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.
NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.
TCDD = 2,3,7,8 tetrachlorodibenzo-p-dioxin.
TCDF = 2,3,7,8 tetrachlorodibenzofuran.
TEC = Toxic Equivalency Concentration (calculated form detected values).
US RM 147 = Upstream of rive mile 147 of the mainstem Willamette River.
DS RM 147 = Downstream of river mile 147 of the mainstem Willamette River.

SA\WH5599.5A

Table 38: Summary of Fish Tissue Results — Metal Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mainstem Willamette River — Carp Fish									
Arsenic	18	1		0.100		0.00077			
Cadmium	18	2	0.020	0.020	0.020				
Chromium	18	1		0.040		54928*			
Copper	18	18	0.130	0.345	0.780				
Lead	18	1		0.030					
Mercury	18	18	0.100	0.155	0.460	1	1		
Zinc	18	18	4.850	8.620	16.280				
Mainstem Willamette River — Squaw Fish									
Copper	4	4	0.170	0.240	0.310				
Mercury	4	4	0.140	0.285	0.440	1	1		
Zinc	4	4	4.650	5.520	7.680				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

* = Value for Chromium III.

SA\WH5610.5

Table 39: Summary of Fish Tissue Results — Pesticide Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mainstem Willamette River — 1988 – 1990									
alpha-BHC	64	6	0.004	0.004	0.039	0.004			
beta-BHC	64	4	0.002	0.005	0.006	0.007			
delta-BHC	64	7	0.002	0.003	0.005				
Lindane	64	4	0.002	0.018	0.045		0.1	0.1	0.51
Heptachlor	64	20	0.002	0.004	0.068	0.003	0.3	0.2	0.21
Heptachlor Epoxide	64	4	0.002	0.003	0.006		0.3	0.2	0.21
Endosulfan I	56	6	0.002	0.003	0.148	42.93			
Endosulfan Sulfate	56	3	0.002	0.019	0.026				
Aldrin	64	4	0.003	0.012	0.103	0.00037	0.3	0.12	0.022
Dieldrin	64	8	0.002	0.005	0.352	0.00036	0.3	0.12	0.022
Endrin	64	4	0.002	0.003	0.061		0.3	0.025	
Endrin Aldehyde	58	3	0.025	0.088	0.109				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5662.5

APPENDIX

A

Sediment Analytical Results by Mile

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APPENDIX A

SUMMARY: SEDIMENT RESULTS BY RIVER

1 SEDIMENT ANALYTICAL RESULTS

1.1 WILLAMETTE RIVER – RIVER MILE 6

Sediment samples collected at this station in 1988 were analyzed for pesticides, Arocolor PCBs, PAHs, inorganics, and TOC.

1.1.1 Pesticide Analysis Results

Three pesticides were detected in the sample collected at this station. p,p' DDE, p,p' DDD, and p,p' DDT were detected at concentrations of 0.0006, 0,035, and 0.0006 mg/kg-wet weight, respectively, TOC was measured at a concentration of 5100 mg/kg-wet weight. Pesticide detection levels were 0.0006 mg/kg-wet weight with the exception of methoxychlor, chlordane, and tocaphane which were 0.012, 0.012, and 0.18 mg/kg wet-weight, respectively (Appendix C).

1.1.2 PCB Analysis Results

Aroclor PCB 1260 was detected in the sample collected at this station at a concentration of 0.35 mg/kg-wet weight. There were no other PCBs detected in samples collected from this station above the analytical detection levels for PCBs (Appendix C).

1.1.3 PAH Analysis Results

Eleven PAHs were detected in the sample collected from this station. The PAHs detected were phenanthrene, anthracene, fluoranthene, benzo(a) anthracene, chrysene, benzo(b)fluoranthene, benzo (k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenz(ah)anthracene, and benzo(ghi) perylene. Phenathrene, anthracene, and fluoranthene were detected at concentrations of 10, 4, and 20 mg/kg-wet weight, respectively. Benzo(a) anthracene, chrysene, benzo(b)fluoranthene, and benzo(k)anthracene, detected at concentration of 5, 6, 7 and 3 mg/kg-wet weight, respectively. Benzo (a)pyrene, indeno(1,2,3-cd)pyrene, dibenz(ah) anthracene, and benzo(ghi)perylene were detected at concentrations of 6, 6, 10, and 9 mg/kg-wet weight, respectively (Appendix C).

1.1.4 Inorganic Analysis Results

The six inorganic parameters tested for in this sample were detected. These parameters were detected at concentrations of 45.5 mg/kg-wet

weight for arsenic, O.9 mg/kg-wet weight for cadmium, 43.2 mg/kg-wet weight for chromium, 47.5 mg/kg-wet weight for copper, 35.7 mg/kg-wet weight for lead, 0.03 mg/kg-wet weight for mercury, and 159 mg/kg-wet weight for zinc. (Appendix C)

1.2 WILLAMETTE RIVER — RIVER MILE 7

Sediment samples were collected from this station in 1988, 1989, and 1990. Two samples collected in 1988 and 1989 were analyzed for pesticides, Aroclor PCBs, PAHs, inorganics, and TOC. Three samples collected in 1990 were analyzed for pesticides, co-planar PCBs, Aroclor PCBs, PAHs, inorganics, and TOC. (Appendix C)

1.2.1 Pesticide Analysis Results

Five pesticides, Alpha-BHC, betaBHC, p,p' DDE, p,p' DDD, and p,p' DDT, were detected at this station. Alpha-BHC was detected once, beta-BHC was detected twice, p,p' DDE and p,p' DDT were each detected three times, and p,p' DDD was detected six times.

Three pesticides, p,p' DDE, p,p' DDD, and p,p' DDT, were detected in both samples collected in 1988. The samples had concentrations of 0.084 and 0.27 mg/kg-wet weight of p,p' DDE, 0.49 and 1.4 mg/kg-wet weight of p,p' DDD, and 0.16 and 0.021 mg/kg-wet weight p,p' DDT. TOC values for these samples were 4 19 O O and 29900 mg/kg-wet weight.

Three pesticides, p,p' DDE, p,p' DDD, and p,p' DDT, were detected in the one sample collected in 1989. Concentrations of p,p' DDE, p,p' DDD, and p,p' DDT were 0.08 [j], 0.8 [j], and 1.64 [j] mg/kg-wet weight, respectively. The "j" indicates that the value is an estimate. TOC values for the samples collected in 1989 were 12000 mg/kg-wet weight for the sample with detectable levels of pesticides and 5000 mg/kg-wet weight for the other sample.

Three pesticides, alpha-BHC, beta-BHC, and p,p' DDD, were detected in samples collected in 1990. Alpha-BHC and beta-BHC were each detected once and p,p' DDD was detected three times. One sample had concentrations of alpha-BHC, beta-BHC, and p,p' DDD at 0.006, 0.007, and 0.008 mg/kg-wet weight, respectively. The TOC value for this sample was 6410 mg/kg-wet weight. The other two samples had p,p' DDD concentrations of 0.006 and 0.009 mg/kg-wet weight. TOC values for these two samples were 8970 and 7040 mg/kg-wet weight.

1988 detection levels were 0.006 and 0.003 mg/kg-wet weight for the pesticides analyzed with the exception of methoxychlor, chlordane, and toxaphene which were 0.012 mg/kg-wet weight, 0.012 mg/kg-wet weight, and 0.18 and 0.045 mg/kg-wet weight, respectively. The 1989 detection levels were 0.004 and 0.012 mg/kg-wet weight for the pesticides analyzed with the exception of methoxychlor and chlordane that were 0.012 mg/kg-wet weight and toxaphene which was 0.045 and 0.36 mg/kg-wet weight. 1990 detection levels were 0.005 with the exception of chlordane and toxaphene that were 0.025 mg/kg-wet weight. (Appendix C)

1.2.2 PCB Analysis Results

One PCB was detected in one sample of the seven samples collected at this station. Aroclor PCB 1260 was detected in a 1988 sample at a concentration of 0.05 mg/kg-wet weight. There were no other PCBs detected in samples collected from this station above the detection levels for the PCBs. (Appendix C)

1.2.3 PAH Analysis Results

A total of twenty-two PAHs were detected in samples collected at this station. PAHs were detected at the following frequency: naphthalene was detected in five of seven samples; azulene was detected in one of three samples; acenapthylene was detected in two of seven samples; acenaphthene was detected in four of seven samples; dibenzofuran was detected in five of five samples; fluorene was detected in five of seven samples; dibenzothiophene was detected in two of three samples; acridine was detected in one of three

samples; phenanthrene was detected in seven of seven samples; anthracene was detected in seven of seven samples; fluoranthene was detected in seven of seven samples; pyrene was detected in six of seven samples; retene was detected in five of five samples; benzo(a)anthracene was detected in seven of seven samples; chrysene was detected in seven of seven samples; benzo(b)fluoranthene was detected in six of seven samples; benzo(k)fluoranthene was detected in six of seven samples; perylene was detected in two of three samples; benzo(a)pyrene was detected in four of seven samples; indeno(1,2,3-cd)pyrene was detected in three of seven samples; dibenz(ah)anthracene was detected in two of seven samples; and benzo(ghi) perylene was detected in three of seven samples.

Two sediment samples were collected at this station in 1988. The detected concentrations of PAHs in the 1988 samples were: phenanthrene at 0.9 and 800 mg/kg-wet weight; anthracene at 0.32 and 200 mg/kg-wet weight; fluoranthene at 2.6 and 900 mg/kg-wet weight; pyrene at 500 mg/kg-wet weight; benzo(a) anthracene at 1.1 and 200 mg/kg-wet weight; chrysene at 1.3 and 300 mg/kg-wet weight; benzo(b)fluoranthene at 1.6 and 300 mg/kg-wet weight; benzo(k)fluoranthene at 0.51 and 100 mg/kg-wet weight; benzo(a)pyrene at 1.7 and 300 mg/kg-wet weight; indeno(1,2,3-cd)pyrene at 300 mg/kg-wet weight; debenz(ah)anthracene at 500 mg/kg-wet weight; and benzo(ghi)perylene at 200 mg/kg-wet weight.

Two sediment samples were collected at this station in 1989. The detected concentrations of PAHs in the 1989 samples were naphthalene at 0.324 [j] and 0.13 [j] mg/kg-wet weight; acenaphthylene at 0.0311 [j] mg/kg-wet weight; acenaphthene at 0.0718 [j] and 0.023 [j] mg/kg-wet weight; dibenzofuran at 0.0345 [j] and 0.0246 [j] mg/kg-wet weight; fluorene at 0.0645 [j] mg/kg-wet weight; phenanthrene at 0.506 [j] and 0.0696 [j] mg/kg-wet weight; anthracene at 0.101 [j] and 0.0287 [j] mg/kg-wet weight; fluoranthene at 0.88 and 0.134 [j] mg/kg-wet weight; pyrene at 0.788 and 0.11 [j] mg/kg-wet weight; retene at 0.662 and 0.0431 [j] mg/kg-wet weight; benzo(a)anthracene at 0.23 [j] and 0.0372 [j] mg/kg-wet weight; chrysene at 0.345 and 0.0714 [j] mg/kg-wet weight; benzo(b)fluoranthene at 0.168 [j] mg/kg-wet weight; benzo(k)fluoranthene at 0.0206 [j] mg/kg-wet weight; benzo(a)anthracene at 0.215 [j] mg/kg-wet weight; indeno(1,2,3-cd)pyrene at 0.127 [j] mg/kg-wet weight; and benzo(ghi)perylene at 0.208 [j] mg/kg-wet weight.

Three sediment samples were collected at this station in 1990. There were twenty-two PAHs detected in these samples. The PAHs detected were; naphthalene, azulene, acenephthylene, acenaphthene, debenzofuran, fluorene, dibenzothiophene, acridine, phenanthrene, anthracene, fluoranthene, pyrene, retene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, perylene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(ah)anthracene, and benzo(ghi) perylene. (Appendix C)

1.2.4. Inorganic Analysis Results

Five of the six inorganic parameters tested for in 1988 were detected and all six parameters were detected in 1989. The two samples collected in 1988 had inorganic concentrations of 18.6 and 54 mg/kg-wet weight for arsenic, 20.4 and 32.9 mg/kg-wet weight for chromium, 31.1 and 53.9 mg/kg-wet weight for copper, 33.9 and 25.2 mg/kg-wet weight for lead, 0.03 and 0.13 mg/kg-wet weight for mercury, and 121 and 160 mg/kg-wet weight for zinc. The two samples collected in 1989 had inorganics detected at concentrations of; 4.47 and 4.99 mg/kg-wet weight for arsenic, 0.07 [j] and 0.16 [j] mg/kg-wet weight for cadmium, 11.9 and 22 mg/kg-wet weight for chromium, 15.7 and 19.2 mg/kg-wet weight for copper, 19.0 [j] and 23.5 [j] mg/kg-wet weight for lead, 0.034 and 0.087 mg/kg-wet weight for mercury, and 75.9 and 87.0 mg/kg-wet weight for zinc. The cadmium detection limit for the 1988 sample was 0.5 mg/kg-wet weight. (Appendix C)

1.3 WILLAMETTE RIVER — RIVER MILE 8

Sediments were collected at this station in 1988 and 1989; three samples were collected in 1988 and one sample was collected in 1989. Samples collected in 1988 were analyzed for pesticides, Aroclor PCBs, PAHs, and inorganics. Samples collected in 1989 were analyzed for pesticides, Aroclor PCBs, inorganics, and TOC.

1.3.1 Pesticide Analysis Results

Three pesticides, p,p' DDE, p,p' DDD, and p,p' DDT, were detected in the 1989 samples. The pesticides were detected at concentrations of 0.014 [j] mg/kg-wet weight for p,p' DDE and 0.019 [j] mg/kg-wet weight for p,p' DDD and p,p' DDT. The TOC value for the sample collected in 1989 was 80000. Pesticide detection levels ranged from 0.008 to 0.04 mg/kg-wet weight with the exception of methoxychlor and chlordane which ranged from 0.008 to 0.08 mg/kg-wet weight and toxaphene which ranged from 0.225 to 0.6 mg/kg-wet weight. (Appendix C)

1.3.2 PCB Analysis Results

One PCB was detected in one of four samples collected from this station. Aroclor PCB 1260 was detected in a 1988 sample at a concentration of 0.26 mg/kg-wet weight. There were no other PCBs detected in samples from this station above the analytical detection levels for the PCBs. (Appendix C)

1.3.3 PAH Analysis Results

The sample collected in 1988 from this station was analyzed for PAHs, 17 were PAHs detected. They were naphthalene, acenephthylene, acenaphthene, dibenzofuran, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, retene, benzo(a)anthracene, chrysene, benzo(b)fluoranthrene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(ah)anthracene, and benzo(ghi)perylene.

PAH concentrations were detected at 0.22 [j] mg/kg-wet weight for naphthalene, 0.0519 [j] mg/kg-wet weight for acenaphthylene, 0.168 mg/kg-wet weight for acenaphthene, 0.0796 mg/kg-wet weight for dibenzofuran, 0.104 [j] mg/kg-wet weight for fluorene, 0.754 mg/kg-wet weight for phenanthrene, 0.1 [j] mg/kg-wet weight for anthracene, 1.14 mg/kg-wet weight for fluoranthene, 0.777 mg/kg-wet weight for pyrene, 0.852 mg/kg-wet weight for retene, 0.31 [j] mg/kg-wet weight for benzo(a)anthracene, 0.497 mg/kg-wet weight for chrysene, 0.476 mg/kg-wet weight for benzo(b) fluoranthene, 0.26 mg/kg-wet weight for benzo(k) fluoranthene, 0.369 [j] mg/kg-wet weight. for benzo(a)pyrene, 0.273 mg/kg-wet weight for indeno(1,2,3-cd)pyrene, 0.187 [j] mg/kg-wet weight for benzo(ah)anthracene, 0.461 [j] mg/kg-wet weight for benzo(ghi)perylene. There were no other PAHs detected in samples from this station above the analytical detection levels for PAHs. (Appendix C)

1.3.4 Inorganic Analysis Results

Five of the six inorganic parameters were detected in the three samples collected in 1988 at this station. All six parameters were detected in the single 1989 sample. The inorganic concentrations detected in 1988 were 3.9, 4.6 and 14.5 mg/kg-wet weight for arsenic; 31.1, 38.8, and 90.8 mg/kg-wet weight for chromium; 89.1, 101, and 320 mg/kg-wet weight for copper; 20.6, 30.5, and 151 mg/kg-wet weight for lead; 0.106, 0.139, and 1.74 mg/kg-wet weight for mercury; and 231, 272, and 703 mg/kg-wet weight for zinc. The inorganic concentrations detected in 1989 were 5.39 mg/kg-wet weight for arsenic, 0.617 mg/kg-wet weight for cadmium, 27.5 mg/kg-wet weight for chromium, 197 mg/kg-wet weight for copper, 35.1 mg/kg-wet weight for lead, 0.092 mg/kg-wet weight for mercury, and 214 mg/kg-wet weight for zinc. The cadmium detection level was 0.5 mg/kg-wet weight for the samples collected in 1988. (Appendix C)

1.4 WILLAMETTE RIVER — RIVER MILE 14

The one sample collected at this station in 1989 was analyzed for the pesticides: Aroclor PCBs, PAHs, inorganics, and TOC (Appendix C).

1.4.1 Pesticide Analysis Results

No pesticides were detected in the sample collected at this station above the analytical detection levels for the pesticides (Appendix C). TOC was detected at a concentration of 2000 mg/kg-wet weight.

1.4.2 PCB Analysis Results

PCBs were not detected in the sample collected

from this station above the analytical detection levels for the PCBs. (Appendix C)

1.4.3 PAH Analysis Results

Five PAHs, naphthalene, phenanthrene, fluoranthene, pyrene, and retene, were detected in the sample collected from this station. The concentrations detected were naphthalene at 0.0083 mg/kg-wet weight, phenathrene at 0.0077 [j] mg/kg-wet weight, fluoranthene at 0.0067 [j] mg/kg-wet weight, pyrene at 0.0094 [j] mg/kg-wet weight, and retene at 0.0444 [j] mg/kg-wet weight. There were no other PAHs detected in samples collected from this station above the analytical detection levels for the PAHs. (Appendix C).

1.4.4 Inorganic Analysis Results

The six inorganic parameters tested for in this sample were detected. The inorganic concentrations were 2.33 mg/kg-wet weight for arsenic, 0.092 [j] mg/kg-wet weight for cadmium, 18.9 mg/kg-wet weight for chromium, 14.6 mg/kg-wet weight for copper, 12.4 mg/kg-wet weight for lead, 0.033 mg/kg-wet weight for mercury, and 73.2 mg/kg-wet weight for zinc. (Appendix C)

1.5 WILLAMETTE RIVER — RIVER MILE 16

The one sediment sample collected at this station in 1988 was analyzed for pesticides, Aroclor PCBs, PAHs, inorganics, and TOC. (Appendix C)

1.5.1 Pesticide Analysis Results

There were no pesticides detected in the sample collected from this station above the analytical detection levels for the pesticides. TOC was detected at a concentration of 37900 mg/kg-wet weight.

1.5.2 PCB Analysis Results

PCBs were not detected in the sample collected from this station at the detection levels indicated. (Appendix C)

1.5.3 PAH Analysis Results

There were eleven PAHs detected in the sediment sample collected at this station. The PAHs were detected at concentrations of 0.19 mg/kg-wet weight for phenanthrene, 0.03 mg/kg-wet weight for anthracene, 0.24 mg/kg-wet weight for fluoranthene, 0.14 mg/kg-wet weight for pyrene, 0.05 mg/kg-wet weight for benzo(a)anthracene, 0.03 mg/kg-wet weight for chrysene, 0.15 mg/kg-wet weight for benzo(b)fluoranthene, 0.02 mg/kg-wet weight for benzo(k)fluoranthene, 0.05 mg/kg-wet weight for benzo(a)pyrene, 0.07 mg/kg-wet weight for indeno(1,2,3-cd)pyrene, and 0.16 mg/kg-wet weight for benzo(ghi)perylene. There were no other PAHs detected in samples from this station above the analytical detection levels for the PAHs. (Appendix C)

1.5.4 Inorganic Analysis Results

Five of the six inorganic parameters tested were detected in the sample collected from this station. The inorganic concentrations were 14.8 mg/kg-wet weight for arsenic, 25.3 mg/kg-wet weight for chromium, 32.3 mg/kg-wet weight for copper, 22.8 mg/kg-wet weight for lead, 0.03 mg/kg-wet weight for mercury, and 107 mg/kg-wet weight for zinc. The detection limit for cadmium was 0.5 mg/kg-wet weight. (Appendix C)

1.6 WILLAMETTE RIVER — RIVER MILE 18

The one sample collected at this station in 1989 was analyzed the for pesticides: Aroclor PCBs, PAHs, inorganics, and TOC. (Appendix C)

1.6.1 Pesticide Analysis Results

No pesticides were detected in the sample collected at this station above the analytical detection levels for the pesticides. TOC was detected at a concentration of 22000 mg/kg-wet weight. Appendix C)

1.6.2 PCB Analysis Results

PCBs were not detected in the sample collected

from this station above the analytical detection levels for the PCBs. (Appendix C)

1.6.3 PAH Analysis Results

There were nine PAHs detected in the sample collected from this station. The PAHs were detected at concentrations of 0.0297 [[j] mg/kg-wet weight for naphthalene, 0.0256 [j] mg/kg-wet weight for phenanthrene, 0.0559 [j] mg/kg-wet weight for fluoranthene, 0.0677 [j] mg/kg-wet weight for pyrene, 0.151 [j] mg/kg-wet weight for retene, 0.0233 [j] mg/kg-wet weight for benzo(a) anthracene, 0.043 [j] mg/kg-wet weight for chrysene, 0.298 [j] mg/kg-wet weight for benzo(b) fluoranthene, and 0.298 [j] mg/kg-wet weight for benzo(k)fluoranthene. There were no other PAHs detected in samples collected from this station above the analytical detection levels for the PAHs. (Appendix C)

1.6.4 Inorganic Analysis Results

The six of the inorganic parameters analyzed for at this station were detected. Inorganic concentrations were 2.98 mg/kg-wet weight for arsenic, 0.13 [j] mg/kg-wet weight for cadmium, 26.7 mg/kg-wet weight for chromium, 20.6 mg/kg-wet weight for copper, 20 [j] mg/kg-wet weight for lead, 0.030 mg/kg-wet weight for mercury, 72.3 mg/kg-wet weight for zinc. (Appendix C)

1.7 WILLAMETTE RIVER – RIVER MILE 27

The two sediment samples, one in 1988 and the other in 1989, collected at this station were analyzed for the pesticides: Aroclor PCBs, PAHs, inorganics, and TOC. (Appendix C)

1.7.1 Pesticide Analysis Results

Pesticides were not detected in samples collected from this station above the analytical detection levels for the pesticides. TOC was detected in the sample collected in 1988 at a concentration of 6200 mg/kg-wet weight. The sample collected in 1989 was not analyzed for TOC. (Appendix C)

1.7.2 PCB Analysis Results

Two samples were analyzed for Aroclor PCBs. PCBs were not detected in the samples collected from this station above the analytical detection levels for the PCBs. (Appendix C)

1.7.3 PAH Analysis Results

Eleven PAHs were detected in samples collected from this station. The PAHs detected at this station were naphthalene, phenanthrene, anthracene, fluoranthene, pyrene, retene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, and benzo(a)pyrene.

The sample collected in 1988 had eight PAHs detected. These PAHs were detected at concentrations of 0.04 mg/kg-wet weight for phenanthrene, 0.02 mg/kg-wet weight for anthracene, 0.06 mg/kg-wet weight for fluoranthene, 0.03 mg/kg-wet weight for benzo(a)anthracene, 0.03 [j] mg/kg-wet weight for chrysene, 0.08 mg/kg-wet weight for benzo(b)fluoranthene, 0.03 mg/kg-wet weight for benzo(X)fluoranthene, and 0.07 mg/kg-wet weight for benzo(a)pyrene. There were no other PAHs detected in samples collected from this station above the analytical detection levels for the PAHs

The sample collected in 1989 had seven PAHs detected. These PAHs were detected at concentrations of 0.0423 [j] mg/kg-wet weight for naphthalene, 0.0412 [j] mg/kg-wet weight for phenanthrene, 0.0854 [j] mg/kg-wet weight for fluoranthene, 0.074 [j] mg/kg-wet weight for pyrene, 0.29 [j] mg/kg-wet weight for retene, 0.0217 [j] mg/kg-wet weight for benzo(a)anthracene, and 0.039 [j] mg/kg-wet weight for chrysene. There were no other PAHs detected in samples collected from this station above the analytical detection levels for the PAHs. (Appendix C)

1.7.4 Inorganic Analysis Results

Four of six inorganic parameters were detected in the sample collected in 1988 and all six parameters

were detected in the sample collected in 1989. Inorganic concentrations for the sample collected in 1988 were 42.6 mg/kg-wet weight for arsenic, 26 mg/kg-wet weight for chromium, 28 mg/kg-wet weight for copper, 5.7 mg/kg-wet weight for lead, and 70.5 mg/kg-wet weight for zinc. The sample collected in 1989 had inorganic concentrations of 3.73 mg/kg-wet weight for arsenic, 0.19 [j] mg/kg-wet weight for cadmium, 32.9 mg/kg-wet weight for chromium, 25.6 mg/kg-wet weight for copper, 8.5 [j] mg/kg-wet weight for lead, 0.034 mg/kg-wet weight for mercury, and 75.6 mg/kg-wet weight for zinc. 1988 detection limits for cadmium and mercury were 0.5 and 0.008 mg/kg-wet weight, respectively. (Appendix C)

1.8 WILLAMETTE RIVER — RIVER MILE 38

The two sediment samples collected at this station, one in 1988 and the other in 1989, were analyzed for pesticides, Aroclor PCBs, PAHs, inorganics, and TOC.

1.8.1 Pesticide Analysis Results

Pesticides were not detected in samples collected from this station above the analytical detection levels for the pesticides. TOC was detected in the 1988 at a concentration of 6100 mg/kg-wet weight. The 1989 sample was not analyzed for TOC. (Appendix C)

1.8.2 PCB Analysis Results

PCBs were not detected in the two samples collected from this station above the analytical detection levels for the PCBs. (Appendix C)

1.8.3 PAH Analysis Results

There were fourteen PAHs detected in samples collected from this station. The PAHs detected were naphthalene, acenaphthylene, acenaphthene, phenanthrene, anthracene, fluoranthene, pyrene, retene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene.

The samples collected in 1988 had nine PAHs detected at concentrations of 0.03 mg/kg-wet weight for phenanthrene, 0.005 mg/kg-wet weight for anthracene, 0.04 mg/kg-wet weight for fluoranthene, 0.008 mg/kg-wet weight for benzo(a) anthracene, 0.006 [j] mg/kg-wet weight for chrysene, 0.06 mg/kg-wet weight for benzo(b) fluoranthene, 0.003 mg/kg-wet weight for benzo(k) fluoranthene, 0.009 mg/kg-wet weight for benzo(a) pyrene, and 0.01 [j] mg/kg-wet weight for indeno (1,2,3-cd)pyrene. There were no other PAHs detected in samples from this station above the analytical detection levels for the PAHs.

The samples collected in 1989 had seven PAHs detected at concentrations of 0.0539 [j] mg/kg-wet weight for naphthalene, 0.0094 [j] mg/kg-wet weight for acenaphthylene, 0.0053 [j] mg/kg-wet weight for acenaphthene, 0.0496 [j] mg/kg-wet weight for phenanthrene, 0.0551 [j] mg/kg-wet weight for fluoranthene, 0.0488 [j] mg/kg-wet weight for pyrene, and 0.29 [j] mg/kg-wet weight for retene. There were no other PAHs detected in samples collected from this station above the analytical detection levels for the PAHs. (Appendix C)

1.8.4 Inorganic Analysis Results

Four of six inorganic parameters were detected in the sample collected in 1988 and all six parameters were detected in the sample collected in 1989. The 1988 sample had inorganic concentrations detected at 18 mg/kg-wet weight for arsenic, 20.6 mg/kg-wet weight for chromium, 23.4 mg/kg-wet weight for copper, 13.6 mg/kg-wet weight for lead, and 72.6 mg/kg-wet weight for zinc. The 1989 sample had inorganic concentrations of; 2.62 mg/kg-wet weight for arsenic, O.19 [j] mg/kg-wet weight for cadmium, 28.2 mg/kg-wet weight for chromium, 26 mg/kg-wet weight for copper, 11 [j] mg/kg-wet weight for lead, 0.028 mg/kg-wet weight for mercury, and 71.8 mg/kg-wet weight for zinc. The 1988 detection limits for cadmium and mercury were 0.5 and 0.008 mg/kg-wet weight, respectively. (Appendix C)

1.9 WILLAMETTE RIVER — RIVER MILE 47

One sediment sample was collected from this

station in 1989 and analyzed for pesticides, Aroclor PCBs, PAHs, inorganics, and TOC.

1.9.1 Pesticide Analysis Results

Pesticides were not detected in the sample collected from this station above the analytical detection levels for the pesticides. TOC was detected at a concentration of 29000 mg/kg-wet weight. (Appendix C)

1.9.2 PCB Analysis Results

PCBs were not detected in the sample collected from this station above the analytical detection levels for the PCBs. (Appendix C)

1.9.3 PAH Analysis Results

Seven PAHs, naphthalene, acenaphthylene, phenanthrene, fluoranthene, pyrene, retene, and chrysene, were detected in the sample collected from this station. The detected PAH concentrations were 0.525 [j] mg/kg-wet weight for naphthalene, 0.0126 [j] mg/kg-wet weight for acenaphthylene, 0.0373 [j] mg/kg-wet weight for phenanthrene, 0.0381 [j] mg/kg-wet weight for fluoranthene, 0.048 [j] mg/kg-wet weight for pyrene, 0.632 [j] mg/kg-wet weight for retene, and 0.0166 [j] mg/kg-wet weight for chrysene. There were no other PAHs detected in the sample from this station above the analytical detection levels for the PAHs. (Appendix C)

1.9.4 Inorganic Analysis Results

All six inorganic parameters were detected in the sample collected from this station. Inorganic concentrations were 2.97 mg/kg-wet weight for arsenic, 0.12 [j] mg/kg-wet weight for cadmium, 28.5 mg/kg-wet weight for chromium, 23.7 mg/kg-wet weight for copper, 13 [j] mg/kg-wet weight for lead, 0.018 mg/kg-wet weight for mercury, and 63.8 mg/kg-wet weight for zinc. (Appendix C)

1.10 WILLAMETTE RIVER — RIVER MILE 48

One sediment sample was collected from this station in 1988 and analyzed for pesticides, Aroclor PCBs, PAHs, inorganics, and TOC.

1.10.1 Pesticides Analysis Results

Pesticides were not detected in samples collected from this station above the analytical detection levels for the pesticides. TOC was detected at a concentration of 18800 mg/kg-wet weight. (Appendix C)

1.10.2 PCB Analysis Results

PCBs were not detected in the sample collected from this station above the analytical detection levels for the PCBs. (Appendix C)

1.10.3 PAH Analysis Results

Seven PAHs, phenanthrene, anthracene, fluoranthene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, and benzo(a)pyrene, were detected in the sample collected from this station. PAHs were detected at concentrations of 0.05 mg/kg-wet weight for phenanthrene, 0.006 mg/kg-wet weight for anthracene, 0.04 mg/kg-wet weight for fluoranthene, 0.007 [j] mg/kg-wet weight for chrysene, 0.1 mg/kg-wet weight for benzo(b)fluoranthene, 0.003 mg/kg-wet weight for benzo(k)fluoranthene, and 0.007 [j] mg/kg-wet weight for benzo(a)pyrene. There were no other PAHs detected in samples from this station above the analytical detection levels for the PAHs. (Appendix C)

1.10.4 Inorganic Analysis Results

Four of six inorganic parameters were detected in the sample collected at this station. Inorganic concentrations were 19.7 mg/kg-wet weight for arsenic, 17.6 mg/kg-wet weight for chromium, 20.6 mg/kg-wet weight for copper, 11.1 mg/kg-wet weight for lead, and 62.5 mg/kg-wet weight for zinc. Detection levels for cadmium and mercury were 0.5 and 0.008 mg/kg-wet weight, respectively. (Appendix C)

1.11 WILLAMETTE RIVER — RIVER MILE 52

One sediment sample was collected at this station

in 1989 and analyzed for pesticides, Aroclor PCBs, PAHs, inorganics, and TOC.

1.11.1 Pesticide Analysis Results

Pesticides were not detected in the sample collected from this station above the analytical detection levels for the pesticides. TOC was detected at a concentration of 49000 mg/kg-wet weight. (Appendix C)

1.11.2 PCB Analysis Results

PCBs were not detected in the sample collected from this station above the analytical detection levels for the PCBs. (Appendix C)

1.11.3 PAH Analysis Results

There were two PAHs detected in samples collected from this station. Pyrene and retene were detected at concentrations of 0.048 [j] and 0.836 [j] mg/kg-wet weight, respectively. There were no other PAHs detected in samples from this station above the analytical detection levels for the PAHs. (Appendix C)

1.11.4 Inorganic Analysis Results

All six inorganic parameters were detected in the sample collected from this station. Inorganic concentrations were 3.16 mg/kg-wet weight for arsenic, 0.18 [j] mg/kg-wet weight for cadmium, 24.6 mg/kg-wet weight for chromium, 22.6 mg/kg-wet weight for copper, 9.9 [j] mg/kg-wet weight for lead, 0.034 mg/kg-wet weight for mercury, and 67.6 mg/kg-wet weight for zinc. (Appendix C)

1.12 WILLAMETTE RIVER – RIVER MILE 74

Two sediment samples were collected at this station in 1990 and analyzed for pesticides, Aroclor PCBs, and PAHs.

1.12.1 Pesticide Analysis Results

Pesticides were not detected in the samples analyzed from this station above the analytical detection levels for the pesticides. (Appendix C)

1.12.2 PCB Analysis Results

Both samples collected at this station were analyzed for Aroclor PCBs. Aroclor PCB 1242 was detected at a concentration of 0.053 mg/kg-wet weight in one sample collected from this station. There were no other PCBs detected in samples from this station above the analytical detection levels for the PCBs. (Appendix C)

1.12.3 PAH Analysis Results

One of the two samples collected at this station had detectable concentrations of PAHs. The PAHs were detected at concentrations of 0.32 mg/kg-wet weight for benzo(b)fluoranthene, 0.14 mg/kg-wet weight for benzo(k)fluoranthene, 0.12 mg/kg-wet weight for benzo(a)pyrene, and 0.11 mg/kg-wet weight for benzo(ghi)perylene. There were no other PAHs detected in samples collected from this station above the analytical detection levels for the PAHs. (Appendix C)

1.13 WILLAMETTE RIVER – RIVER MILE 131

The two sediment samples collected from this station were analyzed for pesticides, co-planar PCBs, Aroclor PCBs, PAHs, metals, and TOC.

1.13.1 Pesticide Analysis Results

Pesticides were not detected in the samples collected from this station above the analytical detection levels for the pesticides. TOC was detected at concentrations of 2960 and 1840 mg/kg-wet weight. (Appendix C)

1.13.2 PCB Analysis Results

PCBs were not detected in the samples collected from this station above the analytical detection levels for the PCBs. (Appendix C)

1.13.3 PAH Analysis Results

PAHs were not detected in samples collected from this station above the analytical detection levels for the PAHs. (Appendix C)

1.14 WILLAMETTE RIVER – RIVER MILE 145

One sediment sample was collected from this station in 1990 and analyzed for PCDDs, PCDFs, and TOC.

1.14.1 PCDD/PCDF Analysis Results

Three PCDDs and three PCDFs were detected in the sample collected from this station. The PCDDs were detected at concentrations of 0.52 ng/kg-wet weight for 1,2,3,6,7,8 HxCDD, 6.7 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDD, and 49 ng/kg-wet weight for OCDD. The PCDFs were detected at concentrations of 0.51 ng/kg-wet weight for 2,3,4,6,7,8 HxCDF, 1.6 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDF, and 4.4 ng/kg-wet weight for OCDF. There were no other PCDDs or PCDFs detected above the analytical detection levels for the PCDD/PCDFs. TOC was measured at a concentration of 7590 mg/kg-wet weight. (Appendix C)

1.15 WILLAMETTE RIVER – RIVER MILE 147

Three sediment samples were collected from this station in 1990 and analyzed for pesticides, co-planar PCBs, Aroclor PCBs, PAHs, inorganics, and TOC. An additional sample was collected both in 1990 and 1991. These two samples were analyzed for PCDDs, PCDFs, and TOC.

1.15.1 Pesticide Analysis Results

Pesticides were not detected in samples collected from this station above the analytical detection levels for the pesticides. TOC was detected at concentrations of 1000, 2320, and 2560 mg/kg-wet weight. (Appendix C)

1.15.2 PCB Analysis Results

PCBs were not detected in the samples collected from this station above the analytical detection levels for the PCBs. (Appendix C)

1.15.3 PAH Analysis Results

PAHs were not detected in samples collected from this station above the analytical detection levels for the PAHs. (Appendix C)

1.15.4 PCDD/PCDF Analysis Results

All PCDDs and PCDFs were detected in the 1990 sample with the exception of two PCDFs, 2,3,7,8 TCDF and 1,2,3,7,8,9 HxCDF. The PCDD concentrations were: 0.42 ng/kg-wet weight for 2,3,7,8 TCDD; 2 ng/kg-wet weight for 1,2,3,7,8 PeCDD; 3.8 ng/kg-wet weight for 1,2,3,4,7,8 HxCDD; 26 ng/kg-wet weight for 1,2,3,6,7,8 HxCDD; 8.2 ng/kg-wet weight for 1,2,3,7,8,9 HxCDD; 540 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDD; and 5600 ng/kg-wet weight for OCDD. The PCDF concentrations were: 0.96 ng/kg-wet weight for 1,2,3,7,8 PeCDF; 2.1 ng/kg-wet weight for 2,3,4,7,8 PeCDF; 3.6 ng/kg-wet weight for 1,2,3,4,7,8 HxCDF; 1.8 ng/kg-wet weight for 1,2,3,6,7,8 HxCDF; 3.7 ng/kg-wet weight for 2,3,4,6,7,8 HxCDF; 49 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDF; 4.2 ng/kg-wet weight for 1,2,3,4,7,8,9 HpCDF; and 210 ng/kg-wet weight for OCDF.

Three PCDDs and three PCDFs were detected in the sample collected in 1991. The PCDD concentrations were: 0.71 ng/kg-wet weight for 1,2,3,6,7,8 HxCDD; 9.4 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDD: and 79 ng/kg-wet weight for OCDD. The PCDF concentrations were: 0.46 ng/kg-wet weight for 2,3,4,6,7,8 HxCDF; 2.3 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDF; and 5.7 ng/kg-wet weight for OCDF. (Appendix C)

TOC values for 1990 and 1991 were 3200 and 7810 mg/kg-wet weight, respectively.

1.16 WILLAMETTE RIVER – RIVER MILE 161

Three sediment samples were collected from this

station in 1990 and analyzed for pesticides, co-planar PCBs, Aroclor PCBs, PAHs, PCDD/PCDF, metals, and TOC.

1.16.1 Pesticide Analysis Results

Beta-BHC was detected in one sample at a concentration of 0.008 mg/kg-wet weight in the samples collected at this station. There were no other pesticides detected above the analytical detection levels for the pesticides. TOC was detected at a concentration of 8010 mg/kg-wet weight in the sample with detectable beta-BHC. TOC values for the other two samples were 3250 and 3910 mg/kg-wet weight. (Appendix C)

1.16.2 PCB Analysis Results

PCBs were not detected in the samples collected from this station above the analytical detection levels for the PCBs. (Appendix C)

1.16.3 PAH Analysis Results

Retene was detected at a concentration of 0.09 mg/kg-wet weight in one sample collected from this station. There were no other PAHs detected in samples collected from this station above the analytical detection levels for the PAHs. (Appendix C)

1.16.4 PCDD/PCDF Analysis Results

Four PCDDs and four PCDFs were detected in the sample collected from this station. The four PCDDs were detected at concentrations of: 1.6 ng/kg-wet weight for 1,2,3,6,7,8 HxCDD; 1.2 ng/kg-wet weight for 1,2,3,7,8,9 HxCDD; 22 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDD; and 130 ng/kg-wet weight for OCDD. PCDFs were detected at concentrations of 0.35 ng/kg-wet weight for 2,3,4,7,8 PeCDF; 0.62 ng/kg-wet weight for 2,3,4,6,7,8 HxCDF; 3.9 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDF; and 9.1 ng/kg-wet weight for OCDF. TOC was measured at a concentration of 13740 mg/kg-wet weight.

1.17 MID-FORK WILLAMETTE RIVER — RIVER MILE 8

Three sediment samples were collected from this station in 1990 and analyzed for pesticides, planar PCBs, Aroclor PCBs, PAHs, PCDD/PCDF, metals, and TOC.

1.17.1 Pesticide Analysis Results

Pesticides were not detected in samples collected from this station at the detection levels indicated. TOC was detected at concentrations of 1720, 5160, and 6940 mg/kg-wet weight. (Appendix C)

1.17.2 PCB Analysis Results

PCBs were not detected in the samples collected from this station above the analytical detection levels for PCBs. (Appendix C)

1.17.3 PAH Analysis Results

Retene was detected at a concentration of 0.15 mg/kg-wet weight in two samples collected from this station. There were no other PAHs detected in samples collected from this station above the analytical detection levels for the PAHs. (Appendix C)

1.17.4 PCDD/PCDF Analysis Results

Six PCDDs and seven PCDFs were detected in the sample collected from this station. The PCDDs were detected at concentrations of: 0.68 ng/kg-wet weight for 1,2,3,7,8 PeCDD; 1.1 ng/kg-wet weight for 1,2,3,4,7,8 HxCDD; 3.1 ng/kg-wet weight for 1,2,3,6,7,8 HxCDD; 1.4 ng/kg-wet weight for 1,2,3,7,8,9 HxCDD; 53 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDD; and 450 ng/kg-wet weight for OCDD. The PCDFs were detected at concentrations of: 0.23 1,2,3,7,8 ng/kg-wet weight for PeCDF; 0.58 ng/kg-wet weight for 2,3,4,7,8 PeCDF; 0.46 ng/kg-wet weight for 1,2,3,4,7,8 HxCDF; O.26 ng/kg-wet weight for 1,2,3,6,7,8 HxCDF; 0.74 ng/kg-wet weight for 2,3,4,6,7,8 HxCDF; 6.8 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDF; and 22 ng/kg-wet weight for OCDF.

TOC was detected at a concentration of 6200 mg/kg-wet weight (Appendix C).

1.18 WILLAMETTE RIVER TRIBUTARIES

1.18.1 Johnson Creek

Four sediment samples, from each station located at river mile 1.1, 5.8, 16.2, and 17.5, were collected in 1991 from Johnson Creek. Samples were analyzed for pesticides and Aroclor PCBs.

- ***Pesticide Analysis Results:***

Four pesticides were detected in the samples collected from Johnson Creek. Endrin aldehyde was detected once, p,p' DDE and p,p' DDD were each detected three times, and p,p' DDT was detected four times.

Sediments collected at river mile 1.1 had one pesticide detected, p,p' DDT, at a concentration of 0.023 mg/kg-wet weight. Sediments collected at river mile 5.8 had concentrations of p,p' DDE at 0.018 mg/kg-wet weight, p,p' DDD at 0.011 mg/kg-wet weight, and p,p' DDT at 0.075 mg/kg-wet weight. Sediments collected at river mile 16.2 had concentrations of endrin aldehyde at 0.045 mg/kg-wet weight, p,p' DDE at 0.13 mg/kg-wet weight, p,p' DDD at 0.069 mg/kg-wet weight, and p,p' DDT at 0.51 mg/kg-wet weight. Sediments collected at river mile 17.5 had concentrations of p,p' DDE at 0.025 mg/kg-wet weight, p,p' DDD at O.014 mg/kg-wet weight, and p,p' DDT at 0.067 mg/kg-wet weight. There were no other pesticides detected above the analytical detection levels for the pesticides. (Appendix C)

- ***PCB Analysis Results:***

PCBs were not detected in samples collected from this station above the analytical detection levels for the PCBs. (Appendix C)

1.18.2 Tualatin River — River Mile 8

Two sediment samples were collected from this station, one in 1988 and the other in 1989. These samples were analyzed for pesticides, Aroclor PCBs, PAHs, and inorganics. TOC was measured in the sample collected in 1989. (Appendix C)

- ***Pesticide Analysis Results:***

Two pesticides were detected in samples collected from this station; p,p' DDE and p,p' DDD were each detected once. The sample collected in 1988 had concentrations of p,p' DDE at 0.006 mg/kg-wet weight and p,p' DDD at 0.003 [m] mg/kg-wet weight. There were no other pesticides detected in samples collected from this station above the detection levels for the pesticides. The 1989 TOC value was 21000 mg/kg-wet weight. (Appendix C)

- ***PCB Analysis Results:***

PCBs were not detected in samples collected from this station at the detection levels indicated (Appendix C).

- ***PAH Analysis Results:***

There were ten PAHs detected in samples collected from this station. The PAHs detected were; pheneathrene, anthracene, fluoranthene, pyrene, retene, benzo(a)anthracene, chrysene, benzo(b) fluoranthene, benzo(k)fluoranthene, dibenz(ah) anthracene.

The sample collected in 1988 had PAH concentrations of 0.0402 [j] mg/kg-wet weight for phenanthrene, 0.132 [j] mg/kg-wet weight for fluoranthene, 0.14 [j] mg/kg-wet weight for pyrene, 0.122 [j] mg/kg-wet weight for retene, 0.0344 [j] mg/kg-wet weight for benzo(a)anthra cene, and 0.0694 [j] mg/kg-wet weight for chrysene. There were no other PAHs detected in this sample above the analytical detection levels for the PAHs.

The sample collected in 1989 had PAH concentrations of 0.099 [j] mg/kg-wet weight for naphthalene, 0.0076 [j] mg/kg-wet weight for anthracene, 0.099 [j] mg/kg-wet weight for fluoranthene, 0.076 [j] mg/kg-wet weight for pyrene, 0.025 [j] mg/kg-wet weight for chrysene,

0.14 [j] mg/kg-wet weight for benzo(b)fluoranthene, 0.041 [j] mg/kg-wet weight for benzo(k) fluoranthene, and 0.053 [j] mg/kg-wet weight for dibenz(ah)anthracene. (Appendix C)

- ***Inorganic Analysis Results:***

All six inorganic parameters were detected in both samples collected from this station. The 1988 sample had inorganic concentrations of 2.8 mg/kg-wet weight for arsenic, 0.5 mg/kg-wet weight for cadmium, 19.2 mg/kg-wet weight for chromium, 30.5 mg/kg-wet weight for copper, 28 mg/kg-wet weight for lead, 0.014 mg/kg-wet weight for mercury, and 86.4 mg/kg-wet weight for zinc. The 1989 sample had inorganic concentrations of 3.98 mg/kg-wet weight for arsenic, 0.54 mg/kg-wet weight for cadmium, 31.5 mg/kg-wet weight for chromium, 21 mg/kg-wet weight for copper, 21.6 [j] mg/kg-wet weight for lead, 0.048 mg/kg-wet weight for mercury, and 109 mg/kg-wet weight for zinc. (Appendix C)

1.18.3 Fanno Creek – River Mile 2

Two sediment samples were collected from this station, one in 1988 and the other in 1989. The samples were analyzed for pesticides, Aroclor PCBs, PAHs, and inorganics.

- ***Pesticide Analysis Results:***

Three pesticides were detected in the samples collected from this station. p,p DDE, p,p' DDD, and p,p' DDT were detected in the sample collected in 1988. p,p' DDE, p,p' DDD, and p,p' DDT were detected at concentrations of 0.006, 0.002 [m], and 0.002 [m] mg/kg-wet weight, respectively. The "m" means that the analyte's presence is indicated but not quantified. There were no other pesticides detected in samples collected from this station above the analytical detection levels for the pesticides. (Appendix C)

- ***PCB Analysis Results:***

Both samples collected from this station were analyzed for PCBs. One PCB was detected in one sample. Aroclor PCB 1254 was detected in the sample collected in 1989 at a concentration of 0.063 [j] mg/kg-wet weight. The "j" notation indicates the value is an estimate. There were no other PCBs detected in samples collected from this station above the analytical detection levels for the PCBs. (Appendix C)

- ***PAH Analysis Results:***

There were a total of twelve PAHs detected in the samples collected from this station. The PAHs detected were phenathrene, anthracene, fluoranthene, pyrene, retene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and benzo (ski)perylene.

There were eleven PAHs detected in the sample collected in 1988. PAHs were detected at concentrations of 0.19 mg/kg-wet weight for phenanthrene, 0.0043 mg/kg-wet weight for anthracene, 0.56 mg/kg-wet weight for fluoranthene, 0.8 mg/kg-wet weight for pyrene, 0.065 mg/kg-wet weight for benzo(a)anthracene, 0.032 mg/kg-wet weight for chrysene, 0.12 mg/kg-wet weight for benzo(b) fluoranthene, 0.024 mg/kg-wet weight for benzo(k) fluoranthene, 0.032 mg/kg-wet weight for benzo(a) pyrene, 0.052 mg/kg-wet weight for indeno(1,2,3-cd)pyrene, and 0.11 mg/kg-wet weight for benzo (ski)perylene.

There was one PAH, retene, detected in the samples collected from this station in 1989 at a concentration of 0.192 j mg/kg-wet. (Appendix C)

- ***Inorganic Analysis Results:***

All six inorganic parameters were detected in both samples collected from this station. The 1988 sample had inorganic concentrations of 3.4 mg/kg-wet weight for arsenic, 0.5 mg/kg-wet weight for cadmium, 32.7 mg/kg-wet weight for chromium, 47.8 mg/kg-wet weight for copper, 50.7 mg/kg-wet weight for lead, 0.062 mg/kg-wet weight for mercury, and 114 mg/kg-wet weight for zinc. The 1989 sample had inorganic concentrations of 3.86 mg/kg-wet weight, 0.592 mg/kg-wet weight for cadmium, 21.2 mg/kg-wet weight for chromi-

um, 17.7 mg/kg-wet weight for copper, 29.6 mg/kg-wet weight for mercury, and 149 mg/kg-wet weight for zinc. (Appendix C)

1.18.4 Beaverton Creek – River Mile 4

Two sediment samples were collected from this station, one in 1988 and the other in 1989. The samples were analyzed for pesticides, Aroclor PCBs, PAHs, and inorganics.

- ***Pesticide Analysis Results:***

Three pesticides were detected in the samples collected from this station. Both samples collected had detectable concentrations of p,p' DDE, p,p' DDD, and p,p' DDT. The sample collected in 1988 had p,p' DDE, p,p' DDD, and p,p' DDT concentrations at 0.005, 0.016, and 0.002 mg/kg-wet weight, respectively. The sample collected in 1989 had p,p' DDE, p,p' DDD, and p,p' DDT concentrations at 0.046 [j], O.28 [j], and 0.034 [j] mg/kg-wet weight, respectively. The "j" notation indicates that the value is an estimate. There were no other pesticides detected in samples collected from this station above the analytical detection levels for the pesticides. (Appendix C)

- ***PCB Analysis Results:***

The two samples collected from this station were analyzed for Aroclor PCBs. One PCB was detected one sample. Aroclor PCB 1260 was detected in a sample collected in 1989 at a concentration of O.36 mg/kg-wet weight. There were no other PCBs detected in samples collected from this station above the analytical detection levels for the PCBs. (Appendix C)

- ***PAH Analysis Results:***

There were a total of twelve PAHs detected in the samples collected from this station. The PAHs detected were naphthalene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo (b)fluoranthene, benzo(k)fluoranthene, benzo(a) pyrene, indeno(1,2,3-cd)pyrene, dibenz(ah)anthracene, and benzo(ski)perylene.

Eight PAHs were detected in the sample collected in 1988. PAHs were detected at concentrations of 0.021 mg/kg-wet weight for phenanthrene, 0.044 mg/kg-wet weight for fluoranthene, 0.0096 [j] mg/kg-wet weight for benzo(a)anthracene, 0.0096 [j] mg/kg-wet weight for chrysene, 0.054 mg/kg-wet weight for benzo(b)fluoranthene, 0.012 mg/kg-wet weight for benzo(X)fluoranthene, 0.017 mg/kg-wet weight for benzo(a)pyrene, and 0.029 mg/kg-wet weight for indeno(1,2,3-cd)pyrene.

Nine PAHs were detected in the sample collected in 1989. PAHs were detected at concentrations of 0.0357 [j] mg/kg-wet weight for naphthalene, 0.122 [j] mg/kg-wet weight for phenanthrene, 0.235 [j] mg/kg-wet weight for fluoranthene, 0.361 [j] mg/kg-wet weight for pyrene, 0.06 [j] mg/kg-wet weight for benzo(a)anthracene, 0.188 [j] mg/kg-wet weight for chrysene, 0.224 [j] mg/kg-wet weight for indeno(1,2,3-cd)pyrene, 0.163 [j] mg/kg-wet weight for dibenz(ah)anthracene, and 0.274 [j] mg/kg-wet weight for benzo(ski)perylene. (Appendix C)

- ***Inorganic Analysis Results:***

All six inorganic parameters were detected in both samples collected from this station. The 1988 sample had inorganic concentrations of 3.1 mg/kg-wet weight for arsenic, 0.5 mg/kg-wet weight for cadmium, 32.7 mg/kg-wet weight for chromium, 47.8 mg/kg-wet weight for copper, 50.7 mg/kg-wet weight for lead, 0.062 mg/kg-wet weight for mercury, and 114 mg/kg-wet weight for zinc. The 1989 sample had inorganic concentrations of 8.77 mg/kg-wet weight for arsenic, 4.5 j mg/kg-wet weight for cadmium, 186 mg/kg-wet weight for chromium, 331 mg/kg-wet weight for copper, 283 mg/kg-wet weight for lead, 0.300 mg/kg-wet weight for mercury, and 398 mg/kg-wet weight for zinc. (Appendix C)

1.18.5 Yamhill River – River Mile 5

Two sediment samples were collected from this station, one each in 1988 and 1989. The samples were analyzed for pesticides, Aroclor PCBs, PAHs, inorganics, and TOC.

- ***Pesticide Analysis Results:***

Pesticides were not detected in samples collected from this station above the analytical detection levels for the pesticides. TOC values in 1988 and 1989 were 41100 and 3000 mg/kg-wet weight, respectively. (Appendix C)

- ***PCB Analysis Results:***

PCBs were not detected in the samples collected from this station above the analytical detection levels for the PCBs. (Appendix C)

- ***PAH Analysis Results:***

There were a total of ten PAHs detected in samples collected from this station. The PAHs detected were naphthalene, anthracene, fluoranthene, pyrene, retene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, and benzo(a)pyrene. (Appendix C)

Seven PAHs were detected in the sample collected in 1988. PAHs were detected at concentrations of 0.001 [j] mg/kg-wet weight for anthracene, 0.02 mg/kg-wet weight for fluoranthene, 0.007 mg/kg-wet weight for benzo(a)anthracene, 0.009 mg/kg-wet weight for chrysene, 0.09 mg/kg-wet weight for benzo(b)fluoranthene, 0.004 mg/kg-wet weight for benzo(k)fluoranthene, and 0.009 mg/kg-wet weight for benzo(a)pyrene. (Appendix C)

Three PAHs were detected in the sample collected in 1989. PAHs were detected at concentrations of 0.028 [j] mg/kg-wet weight for fluoranthene, 0.0245 [j] mg/kg-wet weight for pyrene, and 0.414 mg/kg-wet weight for retene. (Appendix C)

- ***Inorganic Analysis Results:***

Four of six inorganic parameters were detected in the sample collected in 1988 and all six parameters were detected in the 1989 sample. The 1988 sample had inorganic concentrations of 29.6 mg/kg-wet weight for arsenic, 27.2 mg/kg-wet weight for chromium, 39.4 mg/kg-wet weight for copper, 17.1 mg/kg-wet weight for lead, and 87 mg/kg-wet weight for zinc. The 1989 sample had inorganic concentrations of 5.25 mg/kg-wet weight for arsenic, 0.234 mg/kg-wet weight for cadmium, 29.8 mg/kg-wet weight for chromium, 25.8 mg/kg-wet weight for copper, 11 j mg/kg-wet weight for lead, 0.018 mg/kg-wet weight for mercury, and 80.3 mg/kg-wet weight for zinc. The 1988 detection levels for cadmium and mercury were 0.5 and 0.008 mg/kg-wet weight, respectively. (Appendix C)

1.18.6 South Yamhill River – Drainage Ditch

Two sediment samples were collected from drainage ditches receiving runoff from a wood treating facility. The drainage ditches discharged into the South Yamhill River. These samples were collected in 1991 and analyzed for PCDDs and PCDFs.

- ***PCDD/PCDF Analysis Results:***

Seventeen PCDDs and PCDFs were detected in the sample from Taylor Site 4 and fifteen PCDDs and PCDFs were detected in the sample from Taylor site 5.

The concentration of PCDDs in the Taylor Site #4 sample was 66 ng/kg-wet weight for 2,3,7,8 TCDD; 180 ng/kg-wet weight for 1,2,3,7,8 PeCDD; 140 ng/kg-wet weight for 1, 2,3,4,7,8 HxCDD; 600 ng/kg-wet weight for 1,2,3,6,7,8 HxCDD; 230 ng/kg-wet weight for 1,2,3,7,8,9 HxCDD; 13000 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDD; and 100000 ng/kg-wet weight for OCDD. The PCDF concentrations for this sample were 12 ng/kg-wet weight for 2,3,7,8 TCDF; 34 ng/kg-wet weight for 1, 2,3,7,8 PeCDF; 56 ng/kg-wet weight for 2,3,4,7,8 PeCDF; 83 ng/kg-wet weight for 1,2,3, 4,7,8 HxCDF; 51 ng/kg-wet weight for 1,2,3,6,7,8 HxCDF; 98 ng/kg-wet weight for 2,3,4,6,7,8 HxCDF; 39 ng/kg-wet weight for 1,2,3,7,8,9 HxCDF; 1400 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDF; 560 ng/kg-wet weight for 1,2,3,4,7,8,9 HpCDF; and 3900 ng/kg-wet weight for OCDF. The TOC value for this sample was 8300 mg/kg-wet weight. (Appendix C)

The concentration of PCDDs in the Taylor Site #5 sample was 23 ng/kg-wet weight for 2,3,7,8 TCDD; 82 ng/kg-wet weight for 1,2,3,7,8 PeCDD; 260 ng/kg-wet weight for 1,2,3,4,7,8 HxCDD; 1500 ng/kg-wet weight for 1,2,3,6,7,8 HxCDD; 550 ng/kg-wet weight for 1,2,3,7,8,9 HxCDD; 34000 ng/kg-wet weight for 1,2,3,4,6,7,8 HxCDD; and 280000 ng/kg-wet weight for OCDD. The PCDF concentrations for this sample were 19 ng/kg-wet weight for 2,3,7,8 TCDF; 65 ng/kg-wet weight for 1,2,3,7,8 PeCDF; 140 ng/kg-wet weight for 2,3,4,7,8 PeCDF; 190 ng/kg-wet weight for 2,3,4,6,7,8 HxCDF; 100 ng/kg-wet weight for 1,2,3,7,8,9 HxCDF; 4200 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDF; 180 ng/kg-wet weight for 1,2,3,4,7,8,9 HpCDF; and 3600 ng/kg-wet weight for OCDF. The TOC value for this sample was 7900 mg/kg-wet weight. (Appendix C)

1.18.7 Conser Slough – River Mile 0.1

One sediment sample was collected at this station in 1989 and analyzed for pesticides, Aroclor PCBs, PAHs, inorganics, and TOC.

- ***Pesticide Analysis Results:***

Two pesticides were detected at this station; p,p' DDE and p,p'DDT were detected at concentrations of 0.014 [j] and 0.013 [j] mg/kg-wet weight, respectively. The "j" notation indicates that the value is an estimate. The TOC value was 19000 mg/kg-wet weight. There were no other pesticides detected in samples from this station above the analytical detection levels for the pesticides. (Appendix C)

- ***PCB Analysis Results:***

One PCB, 1254, was detected in the sample collected from this station at a concentration of 0.49 [j] mg/kg-wet weight. There were no other PCBs detected in samples collected from this station above the analytical detection levels indicated. (Appendix C)

- ***PAH Analysis Results:***

The one sample collected at this station in 1989 had seven PAHs detected. The PAHs detected and the concentrations were: naphthalene at 0.0443 [j] mg/kg-wet weight, acenaphthene at 0.0093 [j] mg/kg-wet weight, phenanthrene at 0.0954 [j] mg/kg-wet weight, fluoranthene at 0.0865 [j] mg/kg-wet weight, pyrene at 0.116 [j] mg/kg-wet weight, retene at 0.106 [j] mg/kg-wet weight, and chrysene at 0.0213 [j] mg/kg-wet weight. (Appendix C)

- ***Inorganic Analysis Results:***

All six inorganic parameters were detected in the sample collected from this station. The inorganic concentrations were 3.39 mg/kg-wet weight for arsenic, 0.16 [j] mg/kg-wet weight for cadmium, 25.3 mg/kg-wet weight for chromium, 20.5 mg/kg-wet weight for copper, 15 [j] mg/kg-wet weight for lead, 0.065 mg/kg-wet weight for mercury, and 74.7 mg/kg-wet weight for zinc. (Appendix C)

1.18.8 Amazon Creek Drainage:

Three sediment samples were collected in 1991 from drainage ditches receiving runoff from wood treating facilities. These drainage ditches were in the Amazon Creek/A3 Channel drainage areas. The samples were analyzed for PCDDs and PCDFs.

- ***PCDD/PCDF Analysis Results:***

The McFarland Site #1 had seven PCDDs and five PCDFs detected. The concentrations of PCDDs were: 10 ng/kg-wet weight for 2,3,7,8 TCDD; 54 ng/kg-wet weight for 1,2,3,7,8 PeCDD; 93 ng/kg-wet weight for 1,2,3,4,7,8 HxCDD; 300 ng/kg-wet weight for 1,2,3,6,7,8 HxCDD; 170 ng/kg-wet weight for 1,2,3,7,8,9 HxCDD; 6300 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDD; and 49000 ng/kg-wet weight for OCDD. The PCDF concentrations were: 26 ng/kg-wet weight for 2,3,4,7,8 PeCDF; 75 ng/kg-wet weight for 2,3,4,6,7,8 HxCDF; 1400 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDF; 77 ng/kg-wet weight for 1,2,3,4,7,8,9 HpCDF; and 3900 ng/kg-wet weight for OCDF. The TOC value for this sample was 37000 mg/kg-wet weight. (Appendix C)

The McFarland Site #2 had seven PCDDs and

seven PCDFs detected. The concentrations of PCDDs were: 4.2 ng/kg-wet weight for 2,3,7,8 TCDD; 15 ng/kg-wet weight for 1,2,3,7,8 PeCDD; 18 ng/kg-wet weight for 1,2,3,4,7,8 HxCDD; 53 ng/kg-wet weight for 1,2,3,6,7,8 HxCDD; 21 ng/kg-wet weight for 1,2,3,7,8,9 HxCDD; 920 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDD; and 7800 ng/kg-wet weight for OCDD. The PCDF concentrations were: 2.9 ng/kg-wet weight for 1,2,3,7,8 PeCDF; 6.1 ng/kg-wet weight for 2,3,4,7,8 PeCDF; 7.9 ng/kg-wet weight for 1,2,3,4,7,8 HxCDF; 7.7 ng/kg-wet weight for 1,2,3,6,7,8 HxCDF; 15 ng/kg-wet weight for 2,3,4,6,7,8 HxCDF; 170 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDF; and 770 ng/kg-wet weight for/OCDF. The TOC value for this sample was 34600 mg/kg-wet weight. (Appendix C)

The Baxter Site #3 had seven PCDDs and ten PCDFs detected. The concentrations of PCDDs were: 43 ng/kg-wet weight for 2,3,7,8 TCDD; 480 ng/kg-wet weight for 1,2,3,7,8 PeCDD; 1400 ng/kg-wet weight for 1,2,3,4,7,8 HxCDD; 12000 ng/kg-wet weight for 1,2,3,6,7,8 HxCDD; 2700 ng/kg-wet weight for 1,2,3,7,8,9 HxCDD; 220000 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDD; and 1700000 ng/kg-wet weight for OCDD. The PCDF concentrations were: 98 ng/kg-wet weight for 2,3,7,8 TCDF; 320 ng/kg-wet weight for 1,2,3,7,8 PeCDF; 740 ng/kg-wet weight for 2,3,4,7,8 PeCDF; 780 ng/kg-wet weight for 1,2,3,4,7,8 HxCDF; 650 ng/kg-wet weight for 1,2,3,6,7,8 HxCDF; 1100 ng/kg-wet weight for 2,3,4,6,7,8 HxCDF; 690 ng/kg-wet weight for 1,2,3,7,8,9 HxCDF; 16000 ng/kg-wet weight for 1,2,3,4,6,7,8 HpCDF; 620 ng/kg-wet weight for 1,2,3,4,7,8,9 HpCDF; and 33000 ng/kg-wet weight for OCDF. The TOC value for this sample was 34400. (Appendix C)

APPENDIX

B

Fish Tissue Results

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APPENDIX B

SUMMARY: FISH TISSUE RESULTS

1 SUMMARY OF MAINSTEM FISH TISSUE RESULTS BY SPECIES

1.1 PESTICIDE ANALYSIS

Sixty-six fish-tissue samples were collected from the mainstem Willamette River for pesticide analysis: 34 samples from carp, 19 from squawfish, 10 from cutthroat trout, 2 from suckers, and 1 from bass.

Fifteen pesticides were detected in the samples of carp (Table B-1). Three pesticides were detected in greater than 20 percent of the samples of carp. Heptachlor, p,p' DDE, p,p' DDD, and p,p' DDT, which were detected in 27 percent, 79 percent, 53 percent, and 29 percent of the samples, respectively. Median values (calculated from detected values) for all carp samples were less than 0.100 mg/kg wet weight and maximum values were less than 0.500 mg/kg wet weight, with the exception of methoxychlor, which was detected at a concentration of 0.832 mg/kg wet weight.

Fish-tissue evaluation values are available for 12 of the 15 pesticides detected in the samples of carp. The maximum value for one pesticide (dieldrin) exceeded the FDA action level (Table 17). Maximum values for seven pesticides were above the EPA/TV.

Twelve pesticides were detected in the samples of squawfish (Table B-2). One pesticide, p,p' DDE was detected in greater than 20 percent of the squawfish samples. Median values (calculated from detected values) for all samples were less than 0.030 mg/kg-wet weight and maximum values were less than 0.100 mg/kg-wet weight (Table B-2).

Fish-tissue evaluation values are available for 9 of the 12 pesticides detected in the samples of squawfish (Table 17). Maximum values did not exceed FDA action levels or wildlife evaluation values but did exceed the EPA/TV for p,p' DDE and p,p' DDD.

Nine pesticides were detected in samples of cutthroat trout (Table B-3). The number of pesticides detected in a given percent of the samples were: 1 pesticide detected in 10 percent of the samples; 3 in 20 percent; 3 in 30 percent; 1 in 40 percent; and 1 in 80 percent of the samples analyzed. Median values (calculated from detected values) were less than 0.020 mg/kg wet weight and maximum values were less than 0.050 mg/kg wet weight (Table B-3).

Fish-tissue evaluation values are available for 8 of the 9 pesticides detected in the samples of cutthroat trout (Table 17). Maximum values did not exceed FDA action levels or wildlife evaluation values but did exceed the EPA/TV for heptachlor, dieldrin, p,p' DDE, p,p' DDD, and p,p' DDT.

1.2 PCB ANALYSIS

Fish-tissue samples were collected for co-planar PCB analysis (34 samples) and Arochlor PCB analysis (66 samples) (Table B-4). Nine carp, 15 squawfish, and 10 cutthroat trout samples were analyzed for co-planar PCBs. Thirty-four carp, 19 squawfish, 10 cutthroat trout, 2 suckers, and 1 bass were analyzed for Arochlor PCBs.

Three co-planar PCBs were detected in the samples of carp: 2 co-planar PCBs were detected once each and the third was detected twice. Three Arochlor PCBs were detected in samples of carp with none detected in greater than 20 percent of the samples. Maximum PCB values were below the FDA action level and above the EPA/TV (Table B-5).

Two co-planar PCBs and one Arochlor PCB were detected in samples of squawfish. Co-planar PCB 3,3',4,4' was detected in 7 of 15 samples and co-planar PCB 3,3',4,4',5 was detected in 3 of 15 samples, Arochlor 1260 was detected in 9 of 19 samples. Maximum values were below the FDA action level and above the EPA/TV (Table B-6).

Co-planar PCB 3,3',4,4' was detected in 2 of 10 samples of cutthroat trout. The median and maximum value did not exceed 0.003 mg/kg wet weight. The maximum value was below the FDA action level and above the EPA/TV (Table B-7).

1.3 DIOXIN & FURAN ANALYSIS

Twelve whitefish and 4 carp samples collected from the mainstem and tributaries of the Willamette River were analyzed for dioxins and furans.

TCDD, TCDF, and TEC median values (calculated from detected values) were 2.5, 5.6, and 3.02 ng/kg-wet weight, respectively. All detected values for whitefish were above the EPA/TV and below the FDA guidance value. The TCDD median value was below the NYS/DEC noncarcinogenic value and above the NYS/DEC carcinogenic value. The TEC median value was above both NYS/DEC values (Table B-8).

TCDD and TCDF were detected in the four carp samples collected from the mainstem Willamette River. TCDD, TCDF, and TEC median values (calculated from detected values) were 0.445, 0.495, and 0.975 ng/kg wet weight, respectively. All detected values for carp were above the EPA/TV and below the FDA guidance value. The TCDD and TEC median values were above the NYS/DEC wildlife values (Table B-9).

1.4 METALS ANALYSIS

A total of 25 fish-tissue samples were analyzed for metals. Eighteen carp, 4 squawfish, 2 sucker, and 1 bass were analyzed for metals.

There were 7 metals detected in samples of carp (Table B-10): arsenic, chromium, and lead were each detected once, cadmium was detected twice, and copper, mercury, and zinc were detected in all eighteen samples. The median values (calculated from detected values) for copper, mercury, and zinc were 0.345, 0.155, and 8.62 mg/kg wet weight, respectively.

Fish-tissue evaluation values are available for 3 of the 7 metals detected in the samples of carp (Table 16). The arsenic value was above the EPA/TV; the chromium value was below the EPA/TV. Median and maximum values for mercury were below the EPA/TV and the FDA action level.

Three metals were detected in samples of squawfish (Table B-11): Copper, mercury, and zinc were detected in the four samples analyzed for metals. Median values (calculated from detected values) for copper, mercury, and zinc were 0.240, 0.285, and 5.52 mg/kg-wet weight, respectively. Maximum values for copper, mercury, and zinc were 0.310, 0.440, and 7.68 mg/kg wet weight, respectively.

Fish-tissue evaluation values are available for one

of the metals detected (Table 18): median and maximum values for mercury were below the EPA/TV and the FDA action levels.

2 SUMMARY OF FISH TISSUE RESULTS BY RIVER MILE

2.1 PESTICIDE ANALYSIS

2.1.1 River Mile 7

Eleven fish-tissue samples were collected from the mainstem Willamette River at river mile 7 and analyzed for pesticides; 7 pesticides were detected. Four pesticides were detected in greater than 20 percent of the samples. Heptachlor, p,p' DDT, p,p' DDD, and p,p' DDE were detected in 27 percent, 27 percent, 55 percent, and 64 percent of the samples (Table B-12).

Evaluation values are available for 4 of the 7 pesticides detected at this station (Table 18). Median values (calculated from detected values) for 3 pesticides, p,p' DDE, p,p' DDD, and p,p' DDT, were above the EPA/TV. Maximum and median values were below the FDA action levels and NYS/DEC values, respectively.

2.1.2 River Mile 28

Five fish-tissue samples were collected from the mainstem Willamette River at river mile 28 and 14 pesticides were detected. p,p' DDE, p,p' DDD, and p,p' DDT were each detected in all 5 samples (Table B-13).

Evaluation values are available for 10 of the 14 pesticides detected at this station (Table 18). Median values (calculated from detected values) for 6 pesticides (hepatchlor, hepatchlor epoxide, dieldrin, p,p' DDE, p,p' DDD, and p,p' DDT) exceeded the EPA/TV. The dieldrin median value exceeded the NYS/DEC carcinogenic value. With the exception of dieldrin, maximum values did not exceed FDA action levels.

2.1.3 River Mile 38

Four fish-tissue samples were collected from the mainstem Willamette River at river mile 38 and analyzed for pesticides; two pesticides, dieldrin and p,p' DDE, were each detected once. The detected values for dieldrin and p,p' DDE were each above the EPA/TV and less than the FDA action level and NYS/DEC values (Table B-14).

2.1.4 River Mile 48

Six fish-tissue samples were collected from the mainstem Willamette River at river mile 48 and analyzed for pesticides; 3 pesticides were detected. Beta-BHC and methoxychlor were each detected once and p,p' DDE was detected four times (Table B-15).

Evaluation values are available for 2 of the pesticides detected. The median values were below the EPA/TV and the NYS/DEC values. The maximum values were below the FDA action level.

2.1.5 River Mile 74

Twelve fish-tissue samples were collected from the mainstem Willamette River at river mile seventy-four and analyzed for pesticides. There were 11 pesticides detected, with most pesticides detected in less than 25 percent of the samples, with the exception of p,p' DDD and p,p' DDE, which were detected in 42 percent and 83 percent, respectively (Table B-16).

Evaluation values are available for 9 of the 12 pesticides detected at this station (Table 18). Median values (calculated from detected values) for 6 pesticides were above the EPA/TV: alpha-BHC, heptachlor, aldrin, p,p' DDE, p,p' DDD, and p,p' DDT. Aldrin also exceeded the NYS/DEC wildlife value. Maximum values did not exceed FDA action levels.

2.1.6 River Mile 131

There were nine samples collected from the mainstem Willamette River at river mile 131 and analyzed for pesticides: 6 pesticides were detected.

Four pesticides were detected once. p,p' DDE was detected five times and p,p' DDD was detected twice (Table B-17). There are evaluation values for four of the detected pesticides (Table 18). Median values for two of the pesticides, p,p' DDE and p,p' DDD were above the EPA/TV. Median values and maximum values did not exceed the NYS/DEC wildlife values and FDA action levels, respectively.

2.1.7 River Mile 147

There were eight samples collected from the mainstem Willamette River at river mile 147 and analyzed for pesticides: 13 pesticides were detected. Seven of the pesticides were detected once and three were detected twice. Endosulfan I, p,p' DDE, and heptachlor were detected three, four, and five times, respectively (Table B-18).

There are evaluation values for twelve of the thirteen pesticides detected. Median values (calculated from detected values) for seven pesticides were above the EPA/TV. These pesticides were; aldrin, dieldrin, p,p' DDE, p,p' DDD, p,p' DDT, chlordane, and toxaphene. Median values did not exceed the NYS/DEC wildlife values. Maximum values did not exceed the FDA action levels.

2.1.8 River Mile 161

There were eight samples collected from the mainstem Willamette River at river mile 161 and analyzed for pesticides: 9 pesticides were detected. Six of the pesticides were detected once. P,p' DDE, dieldrin, and heptachlor were each detected two, three, and four times, respectively (Table B-19).

There are evaluation values for the eight pesticides detected (Table 18). Median values (calculated from detected values) for six pesticides were above the EPA/TV. Median and maximum values did not exceed the NYS/DEC wildlife values or the FDA action levels, respectively.

2.1.9 Johnson Creek

There were sixteen samples collected from Johnson Creek and analyzed for pesticides: 4 pesticides were detected. Beta-BHC, p,p' DDD and p,p' DDT were each detected three, four, and eight times, respectively. P,p' DDE was detected in all sixteen samples (Table B-20).

There are evaluation values for three of the four pesticides detected (Table 18). Median values (calculated from detected values) for three pesticides, p,p' DDE, p,p' DDD, and p,p' DDT, were above the EPA/TV. The maximum value for one pesticide, p,p' DDT, was above the NYS/DEC wildlife value. Maximum values were not above the FDA action levels.

2.1.10 Conser Slough

There were five samples collected from Conser Slough and analyzed for pesticides. Three pesticides, dieldrin, endrin, and methoxychlor, were each detected twice (Table B-21).

There are evaluation values for two of the detected pesticides (Table 18). The median value (calculated from detected values) for dieldrin was above the EPA/TV. Median and maximum values did not exceed the NYS/DEC wildlife value or the FDA action level, respectively.

2.1.11 Mid Fork Willamette River

There were six samples collected from the Mid Fork Willamette River and analyzed for pesticides. Two pesticides were detected, heptachlor twice and endrin once (Table B-22).

There are evaluation values for both pesticides detected. The median value (calculated from detected values) for heptachlor exceeded the EPA/TV. Median and maximum values for heptachlor and endrin did not exceed the NYS/DEC wildlife value or the FDA action level, respectively (Table 18).

2.2 PCB ANALYSIS

2.2.1 River Mile 7

There were six co-planar PCB and twelve Arochlor PCB samples collected from the mainstem Willa-

mette River at river mile 7. There were three co-planar and three Arochlor PCBs detected. The co-planar PCBs and the number of times detected were; 3,3'4,4' TCBP detected three times, 2,3, 3'4,4' PeCBP detected once, and 3,3'4,4'5 PeCBP detected twice. The Arochlor PCBs 1242 and 1254 each detected once and 1260 detected five times (Table B-23).

Co-planar and Arochlor PCB median values (calculated from detected values) exceeded the EPA/TV. Detected values for Arochlor 1242 and 1254 exceeded the NYS/DEC wildlife value. Maximum values did not exceed the FDA action levels (Table 18).

2.2.2 River Mile 27

There were four samples collected from the mainstem Willamette River at river mile 27 and analyzed for Arochlor PCBs. Two PCBs were detected, Arochlor 1254 and 1260 were each detected once at concentrations of 0.205 and 0.119 mg/kg-wet weight, respectively (Table B-24).

The detected values were above the EPA/TV and the NYS/DEC wildlife value but below the FDA action level (Table 18).

2.2.3 River Mile 38

There were four samples collected from the mainstem Willamette River at river mile 38 for Arochlor PCB analysis. The PCB, Arochlor 1260 was detected once at a concentration of 0.015 mg/kg-wet weight (Table B-25).

The Arochlor 1260 detected concentration was above the EPA/TV and below the NYS/DEC wildlife value and FDA action level (Table 18).

2.2.4 River Mile 48

There were six samples collected from the mainstem Willamette River at river mile 48 and analyzed for Arochlor PCBs. Two Arochlor PCBs were detected. Arochlor 1254 and 1260 were each detected once at concentrations of 0.109 and 0.062 mg/kg-wet weight, respectively (Table B-26).

The concentrations of Arochlor 1254 and 1260 were above the EPA/TV and below the NYS/DEC value and FDA action level (Table 18).

2.2.5 River Mile 74

There were six samples collected for co-planar PCB and twelve samples collected for Arochlor PCB analysis from the mainstem Willamette River at river mile 74. Two PCBs were detected, co-planar PCB 3,3'4,4' TCBP and Arochlor 1260 with each detected three times (Table B-27).

The median values for 3,3'4,4' TCBP and Arochlor 1260 were above the EPA/TV but below the NYS/DEC wildlife value (Table 18). Maximum values were below the FDA action level.

2.2.6 River Mile 131

There were six samples collected for co-planar and Arochlor PCB analysis from the mainstem Willamette River at river mile 131. One PCB was detected, co-planar PCB 3,3'4,4' TCBP was detected once at a concentration of 0.002 mg/kg-wet weight (Table B-28). The detected concentration was below the evaluation values (Table 18).

2.2.7 River Mile 147

Eight samples were collected for co-planar and Arochlor PCB analysis from the mainstem Willamette River at river mile 147. Two PCBs were detected, co-planar PCB 3,3'4,4' TCBP twice and Arochlor 1260 once (Table B-29).

The median value for 3,3'4,4' TCBP and Arochlor 1260 was above the EPA/TV but below the NYS/DEC wildlife value. Maximum values were below the FDA action level (Table 18).

2.2.8 Mile 161

Eight samples were collected for co-planar and Arochlor PCB analysis from the mainstem Willamette River at river mile 161. Three PCBs were detected, co-planar PCBs 3,3'4,4' TCBP and 3, 3'4,4'5 PeCBP and Arochlor 1260 were detected

three, two and three times, respectively (Table B-30).

Median values for the three PCBs detected were above the EPA/TV and below the NYS/DEC wildlife values. Maximum values were below the FDA action levels (Table 18).

2.2.9 Conser Slough

Six samples were collected from Conser Slough and analyzed for Arochlor PCBs. Arochlor 1242 was detected twice and 1254 was detected once (Table B-31).

The median value for Arochlor 1242 and the detected value for Arochlor 1254 were above the EPA/TV and the NYS/DEC wildlife value. Maximum values were below the FDA action level (Table 18).

2.2.10 Mid Fork Willamette

Six samples were collected from the Mid Fork Willamette River at river mile 8 and analyzed for co-planar and Arochlor PCBs. Co-planar PCBs 3,3'4,4' TCBP, 2,3,3'4,4' PeCBP, and 3,3'4,4'5 PeCBP were each detected four, three and two times, respectively (Table B-32).

Median values for detected PCBs were above the EPA/TV. 3,3'4,4' TCBP and Arochlor 1260 median values were also above the NYS/DEC wildlife value. Maximum values were not above the FDA action level for PCBs (Table 18).

2.3 DIOXIN & FURAN ANALYSIS

Whitefish were collected in 1990 and 1991 upstream and downstream of river mile 147 of the mainstem Willamette River. There were five samples collected upstream and seven samples collected downstream. TCDD was detected in four of the five samples collected upstream and all of the samples collected downstream. TCDF was detected in all samples (Table B-33).

TCDD upstream and downstream median values (calculated from detected values) were 0.53 and 2.7 ng/kg-wet weight, respectively. TCDF upstream and downstream median values were 2.55 and 13.0 ng/kg-wet weight, respectively. The TEC upstream and downstream median values were 1.24 and 4.01 ng/kg-wet weight, respectively. Maximum values for TCDD, TCDF and TEC were lower upstream than downstream (Table B-33). Whitefish median and maximum values were lower in samples collected in 1991 than in samples collected in 1990. Upstream median values were lower than downstream samples for samples collected in both years (Table B-34).

All detected TCDD and TEC values were above the EPA/TV and below the FDA guidance value. The upstream TCDD median value was below and the downstream median value was above the NYS/DEC wildlife values. Upstream and downstream TEC median values were above the NYS/DEC wildlife values (Table 18).

There were four carp samples collected from the mainstem Willamette River and analyzed for dioxins and furans. Concentrations of TCDD and TCDF were generally lower in carp than whitefish (Table B-35).

2.4 METALS ANALYSIS

2.4.1 River Mile 7

There were five samples collected from the mainstem Willamette River at river mile 7 for metals analysis. Five metals were detected. Cadmium, copper, lead, mercury, and zinc were detected one, five, one, five, and five times, respectively (Table B-36).

One metal, mercury, has an evaluation value. The EPA/TV and the FDA action level have a mercury value of 1.0 mg/kg-wet weight (Table 18). Median and maximum values for mercury were not above the FDA action level.

2.4.2 River Mile 27

There were four samples collected from the mainstem Willamette River at river mile 27 and analyzed for metals. Three metals were detected.

Copper, mercury, and zinc were each detected in four samples (Table B-37). Mercury maximum values were below the FDA action level (Table 18).

2.4.3 River Mile 28

There were three samples collected from the mainstem Willamette River at river mile 28 and analyzed for metals. Five metals were detected. Cadmium and chromium were each detected once and copper, mercury, and zinc were each detected three times (Table B-38). Mercury maximum values were below the FDA action level of 1.0 mg/kg-wet weight and chromium values were below the EPA/TV (Table 18).

2.4.4 River Mile 38

There were four samples collected from the mainstem Willamette River at river mile 38 and analyzed for metals. Three metals were detected. Copper, mercury, and zinc were each detected four times (Table B-39). The maximum value for mercury was below the FDA action level (Table 18).

2.4.5 River Mile 48

There were four samples collected from the mainstem Willamette River at river mile 48 and analyzed for metals. Four metals were detected. Arsenic was detected once and copper, mercury, and zinc were each detected four times (Table B-40). The maximum value for mercury was below the FDA action level (Table 18).

2.4.6 River Mile 74

There were three samples collected from the mainstem Willamette River at river mile 74 and analyzed for metals. There were three metals detected. Copper, mercury, and zinc were each detected three times (Table B-41). The maximum value for mercury was below the FDA action level (Table 18).

2.4.7 Johnson Creek

There were eight samples collected from Johnson Creek and analyzed for metals. There were seven metals detected. Chromium and lead were detected five and six times, respectively. Barium, cadmium, copper, mercury, and zinc were each detected eight times (Table B-42). The Mercury maximum value was below the FDA action level and the chromium maximum value was below the EPA/TV (Table 18).

2.4.8 Conser Slough

There were five samples collected from Conser Slough and analyzed for metals. There were three metals detected. Copper, mercury, and zinc were each detected five times (Table B-43). Mercury maximum concentrations were below the FDA action level (Table 18).

Table B-1: Summary of Carp Results — Pesticide Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Levels	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mainstem Willamette River									
alpha-BHC	34	5	0.004	0.004	0.039	0.004			
beta-BHC	34	2	0.003	0.005	0.006	0.007			
delta-BHC	27	4	0.002	0.003	0.005				
Lindane	34	4	0.002	0.018	0.045		0.1	0.1	0.51
Heptachlor	34	9	0.002	0.005	0.068	0.003	0.3	0.2	0.21
Heptachlor Epoxide	34	2	0.002	0.005	0.006		0.3	0.2	0.21
Endosulfan I	28	2	0.004	0.076	0.148	42.93			
Endosulfan Sulfate	28	2	0.019	0.023	0.026				
Aldrin	34	2	0.020	0.062	0.103	0.00037	0.3	0.12	0.022
Dieldrin	34	4	0.006	0.048	0.352	0.00036	0.3	0.12	0.022
Endrin	34	1		0.061			0.3	0.025	
p,p' DDE	34	27	0.004	0.032	0.266	0.0013	5	0.2	0.27
p,p' DDD	34	18	0.004	0.016	0.144	0.0013	5	0.2	0.27
p,p' DDT	34	10	0.005	0.012	0.216	0.0013	5	0.2	0.27
Methoxychlor	34	3	0.003	0.069	0.832				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

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Table B-2: Summary of Squawfish Results — Pesticide Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Levels	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mainstem Willamette River									
alpha-BHC	19	1		0.004		0.004			
beta-BHC	19	2	0.002	0.004	0.006	0.007			
delta-BHC	16	1		0.003					
Heptachlor	19	1		0.002		0.003	0.3	0.2	0.21
Endosulfan I	16	1		0.002		42.93			
Endosulfan Sulfate	16	1		0.002					
Aldrin	19	1		0.004		0.00037	0.3	0.12	0.022
p,p' DDE	19	12	0.005	0.022	0.052	0.0013	5	0.2	0.027
p,p' DDD	19	3	0.002	0.003	0.008	0.0013	5	0.2	0.27
Methoxychlor	19	1		0.004					
Chlordane	19	1		0.025		0.0068	0.3	0.5	0.37
Toxaphene	16	1		0.025		0.0096	5		

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

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Table B-3: Summary of Carp and Cutthroat Trout Results — Pesticide Analysis

Parameter	Species	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Levels	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
		Samples	Detects							
	Mainstem Willamette River									
alpha-BHC	Carp	34	5	0.004	0.004	0.039	0.004			
beta-BHC	Carp	34	2	0.003	0.005	0.006	0.007			
delta-BHC	Carp	27	4	0.002	0.003	0.005				
Lindane	Carp	34	4	0.002	0.018	0.045		0.1	0.1	0.51
Heptachlor	Carp	34	9	0.002	0.005	0.068	0.003	0.3	0.2	0.21
Heptachlor Epoxide	Carp	34	2	0.002	0.005	0.006		0.3	0.2	0.21
Endosulfan I	Carp	28	2	0.004	0.076	0.148	42.93			
Endosulfan Sulfate	Carp	28	2	0.019	0.023	0.026				
Aldrin	Carp	34	2	0.020	0.062	0.103	0.00037	0.3	0.12	0.022
Dieldrin	Carp	34	4	0.006	0.048	0.352	0.00036	0.3	0.12	0.022
Endrin	Carp	34	1		0.061			0.3	0.025	
p,p' DDE	Carp	34	27	0.004	0.032	0.266	0.0013	5	0.2	0.27
p,p' DDD	Carp	34	18	0.004	0.016	0.144	0.0013	5	0.2	0.27
p,p' DDT	Carp	34	10	0.005	0.012	0.216	0.0013	5	0.2	0.27
Methoxychlor	Carp	34	3	0.003	0.069	0.832				
delta-BHC	Cut Throat	10	3	0.002	0.003	0.006				
Heptachlor	Cut Throat	10	8	0.002	0.004	0.008	0.003	0.3	0.2	0.21
Endosulfan I	Cut Throat	10	3	0.002	0.002	0.003	42.93			
Aldrin	Cut Throat	10	1		0.003		0.00037	0.3	0.12	0.022
Dieldrin	Cut Throat	10	4	0.002	0.002	0.003	0.00036	0.3	0.12	0.022
Endrin	Cut Throat	10	3	0.002	0.002	0.002		0.3	0.025	
p,p' DDE	Cut Throat	10	2	0.006	0.018	0.023	0.0013	5	0.2	0.27
p,p' DDD	Cut Throat	10	2	0.002	0.003	0.003	0.0013	5	0.2	0.27
p,p' DDT	Cut Throat	10	2	0.005	0.006	0.007	0.0013	5	0.2	0.27

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

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Table B-4: Summary of Fish Tissue Analyses

River	Station	River Miles	Sample Date	No. of Samples	Species	Sample Type	Tissue Type	Pesticides	Co-Planer PCBs	Arocior PCBs	PAHs	PCDD / PCDF	Metals
1988 – 1991 Analytical Results													
Willamette	SP&S Bridge	7	Jul 90	3	Squawfish	s	wb	X	X	X	X	O	O
			Jul 90	3	Carp	s	ef	X	X	X	X	O	O
			Aug 89	3	Carp	s	ef	X	O	X	X	O	X
			Aug 88	2	Carp	s	ef	X	O	X	O	O	X
	Kellogg Creek	18	Sep 89	1	Carp	c	ef	X	O	X	X	O	X
			Sep 89		Sucker	c	ef	X	O	X	X	O	X
	Down Stream Oregon City	27	Aug 88	1	Bass	c	ef	X	O	X	O	O	X
			Aug 88	2	Carp	c	ef	X	O	X	O	O	X
			Aug 88	1	Squawfish	c	ef	X	O	X	O	O	X
	Up Stream Oregon City	28	Aug 89	3	Carp	s	ef	X	O	X	X	O	X
			Aug 89	3	Carp	s	lvr	X	O	X	X	O	O
	Wilsonville	38	Aug 89	1	Sucker	c	ef	X	O	X	X	O	X
			Aug 89	1	Squawfish	c	ef	X	O	X	X	O	X
			Aug 88	1	Carp	c	ef	X	O	X	O	O	X
			Aug 88	1	Squawfish	c	ef	X	O	X	O	O	X
	Newberg	48	Aug 89	2	Carp	s	ef	X	O	X	X	O	X
			Aug 89	2	Carp	s	lvr	X	O	X	X	O	O
			Aug 88	1	Carp	c	ef	X	O	X	O	O	X
			Aug 88	1	Squawfish	c	ef	X	O	X	O	O	X
	Wheatland Ferry	74	Jul 90	3	Squawfish	s	wb	X	X	X	X	O	O
			Jul 90	3	Carp	s	ef	X	X	X	X	O	O
			Aug 89	3	Carp	s	ef	X	O	X	X	O	X
			Aug 89	3	Carp	s	lvr	X	O	X	X	O	O
	Corvallis	131	Jul 90	3	Squawfish	s	wb	X	X	X	X	O	O
			Jul 90	3	Carp	s	ef	X	X	X	X	O	O

Table B-4: Summary of Fish Tissue Analyses *(Continued)*

River	Station	River Miles	Sample Date	No. of Samples	Species	Sample Type	Tissue Type	Pesticides	Co-Planer PCBs	Arocior PCBs	PAHs	PCDD / PCDF	Metals
Willamette *(Continued)*	Corvallis *(Continued)*	141	Sep 91	1	Carp	c	wb	O	O	O	O	X	O
			Aug 91	1	Whitefish	c	ef	O	O	O	O	X	O
		143	Sep 91	1	Carp	c	wb	O	O	O	O	X	O
			Aug 91	1	Whitefish	c	ef	O	O	O	O	X	O
			Nov 90	1	Whitefish	c	ef	O	O	O	O	X	O
		145	Sep 91	1	Carp	c	wb	O	O	O	O	X	O
			Aug 91	1	Whitefish	c	ef	O	O	O	O	X	O
			Nov 90	1	Whitefish	c	ef	O	O	O	O	X	O
	Halsey	147	Nov 90	1	Whitefish	c	ef	O	O	O	O	X	O
			Jul 90	3	Squawfish	s	wb	X	X	X	X	O	O
			Jul 90	2	Cut Trout	s	wb	X	X	X	X	O	O
			Oct 90	3	Cut Trout	s	wb	X	X	X	X	O	O
	Harrisburg	161	Oct 91	1	Carp	c	wb	O	O	O	O	X	O
			Aug 91	1	Whitefish	c	ef	O	O	O	O	X	O
			Jul 90	3	Squawfish	s	wb	X	X	X	X	O	O
			Jul 90	2	Cut Trout	s	wb	X	X	X	X	O	O
			Oct 90	3	Cut Trout	s	wb	X	X	X	X	O	O
Mid Fork Willamette	Jasper	8	Nov 90	1	Whitefish	c	ef	O	O	O	O	X	O
			Jul 90	3	Squawfish	s	wb	X	X	X	X	O	O
			Jul 90	3	Cut Trout	s	wb	X	X	X	X	O	O
Johnson Creek			Apr 91	8	Crayfish	c	ef	X	O	X	X	O	O
			Apr 91	8	Crayfish	c	wb	X	O	X	X	O	O
Tualatin		8	Jun 05	1	Sucker	c	ef	X	X	X	X	O	X
Yamhill		5	Jun 05	1	Sucker	c	ef	X	X	X	X	O	X
Santiam		0.5	Aug 88	1	Squawfish	c	ef	X	X	X	O	O	X
Conser Slough		0.1	Oct 89	1	Sucker	c	ef	X	X	X	X	O	X

Table B-4: Summary of Fish Tissue Analyses *(Continued)*

River	Station	River Miles	Sample Date	No. of Samples	Species	Sample Type	Tissue Type	Pesticides	Co-Planer PCBs	Arocior PCBs	PAHs	PCDD / PCDF	Metals
Conser Slough *(Continued)*	Jasper	0.1	Oct 89	2	Squawfish	c	ef	X	X	X	X	O	X
			Aug 88	1	Bass	c	ef	X	X	X	O	O	X
			Aug 88	1	Carp	c	ef	X	X	X	O	O	X
McKenzie		3	Nov 90	1	Whitefish	c	ef	O	O	O	O	X	O

LEGEND:

s = Single
c = Composite
X = Analyzed
O = Not Analyzed
wb = Whole Body
ef = Edible Fillet
lvr = Liver

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Table B-5: Summary of Carp Tissue Results — PCB Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Levels	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mainstem Willamette River									
3,3'4,4' TCBP	9	3	0.002	0.002	0.037				
2,3,3'4,4' PcCBP	9	1		0.006					
3,3'4,4'5 PeCBP	9	1		0.021					
Arochlor 1242	34	1		0.119					
Archlor 1254	34	4	0.109	0.183	0.360				
Arochlor 1260	34	6	0.015	0.064	1.403	0.0025	2	0.11	

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

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Table B-6: Summary of Squawfish Results — PCB Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Levels	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mainstem Willamette River									
3,3'4,4' TCBP	15	7	0.003	0.004	0.011				
3,3'4,4'5 PeCBP	15	3	0.002	0.005	0.006				
Arochlor 1260	19	9	0.026	0.046	0.209	0.0025	2	0.2	0.11

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.
NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5573.5

Table B-7: Summary of Cutthroat Trout Results: PCB Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Levels	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mainstem Willamette River									
3,3'4,4' TCBP	10	2	0.003	0.003	0.003	0.0025	2	0.11	

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.
NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5574.5

Table B-8: Summary of Whitefish Results — TCDD, TCDF, TEC Range & Medians

Parameter	Location	Number of		Minimum	Median	Maximum	EPA/TV	FDA Value	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
		Samples	Detects							
	Mainstem Willamette River									
TCDD		12	11	0.27	2.5	7.9	0.07	25	3.0	2.3
TCDF		12	12	1.7	5.6	30				
TEC		12	12	0.21	3.02	10.9	0.07	25	3.0	2.3

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.
NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.
TCDD = 2,3,7,8 tetrachlorodibenzo-p-dioxin.
TCDF = 2,3,7,8 tetrachlorodibenzofuran.
TEC = Toxic Equivalency Concentration (calculated from detected values).

SA\WH5575.5

Table B-9: Summary of Carp Results — TCDD, TCDF, TEC Range & Medians

Parameter	Location	Number of		Minimum	Median	Maximum	EPA/TV	FDA Value	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
		Samples	Detects							
	Mainstem Willamette River									
TCDD		4	4	0.41	0.445	0.57	0.07	25	3.0	2.3
TCDF		4	4	0.41	0.495	0.56				
TEC		4	4	0.78	0.975	1.39	0.07	25	3.0	2.3

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.
NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.
TCDD = 2,3,7,8 tetrachlorodibenzo-p-dioxin.
TCDF = 2,3,7,8 tetrachlorodibenzofuran.
TEC = Toxic Equivalency Concentration (calculated form detected values).

SA\WH5576.5

Table B-10: Summary of Carp Tissue Results — Metal Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mainstem Willamette River									
Arsenic	18	1		0.100		0.00077			
Cadmium	18	2	0.020	0.020	0.020				
Chromium	18	1		0.040		54928*			
Copper	18	18	0.130	0.345	0.780				
Lead	18	1		0.030					
Mercury	18	18	0.100	0.155	0.460	1	1		
Zinc	18	18	4.850	8.620	16.280				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

* = Value for Chromium III.

SA\WH5611.5

Table B-11: Summary of Squaw Fish Tissue Results — Metal Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mainstem Willamette River									
Copper	4	4	0.170	0.240	0.310				
Mercury	4	4	0.140	0.285	0.440	1	1		
Zinc	4	4	4.650	5.520	7.680				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5610.5

Table B-12: Summary of Fish Tissue Results

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 7									
alpha-BHC	11	1		0.004		0.004			
Heptachlor	11	3	0.002	0.003	0.007	0.003	0.3	0.2	0.21
Endosulfan Sulfate	9	1		0.026					
p,p' DDE	11	7	0.012	0.033	0.066	0.0013	5	0.2	0.27
p,p' DDD	11	6	0.004	0.010	0.063	0.0013	5	0.2	0.27
p,p' DDT	11	3	0.005	0.007	0.019	0.0013	5	0.2	0.27
Methoxychlor	11	1		0.003					

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5577.5

Table B-13: Summary of Fish Tissue Results

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 28									
alpha-BHC	5	3	0.004	0.004	0.004	0.004			
delta-BHC	5	3	0.002	0.003	0.005				
Lindane	5	1		0.002			0.1	0.1	0.51
Heptachlor	5	3	0.002	0.005	0.007	0.003	0.3	0.2	0.21
Heptachlor Epoxide	5	2	0.004	0.005	0.006	0.003	0.3	0.2	0.21
Endosulfan I	5	1		0.148		42.93			0.21
Endosulfan Sulfate	5	1		0.019					
Dieldrin	5	3	0.01	0.086	0.352	0.00036	0.3	0.12	0.022
Endrin	5	1		0.061			0.3	0.025	
Endrin Aldehyde	5	2	0.025	0.057	0.088				
p,p' DDE	5	5	0.061	0.102	0.266	0.0013	5	0.2	0.27
p,p' DDD	5	5	0.020	0.050	0.144	0.0013	5	0.2	0.27
p,p' DDT	5	5	0.010	0.016	0.216	0.0013	5	0.2	0.27
Methoxychlor	5	1		0.832					

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5578.5

Table B-14: Summary of Fish Tissue Results

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 38									
Dieldrin	4	1		0.006		0.00036	0.3	0.12	0.022
p,p' DDE	4	1		0.007		0.0013	5	0.2	0.27

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5579.5

Table B-15: Summary of Fish Tissue Results

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 48									
beta-BHC	6	1		0.003		0.007			
p,p' DDE	6	4	0.005	0.011	0.063	0.0013	5	0.2	0.27
Methoxychlor	6	1		0.004					

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5580.5

Table B-16: Summary of Fish Tissue Results

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 74									
alpha-BHC	12	2	0.022	0.031	0.039	0.004			
beta-BHC	12	1		0.006		0.007			
Lindane	12	3	0.002	0.034	0.045		0.1	0.1	0.51
Heptachlor	12	3	0.002	0.014	0.031	0.003	0.3	0.2	0.21
Endosulfan I	12	1		0.004		42.93			
Aldrin	12	2	0.020	0.062	0.103	0.00037	0.3	0.12	0.022
Endrin Aldehyde	12	1		0.109					
p,p' DDE	12	10	0.007	0.024	0.073	0.0013	5	0.2	0.27
p,p' DDD	12	5	0.004	0.012	0.055	0.0013	5	0.2	0.27
p,p' DDT	12	1		0.010		0.0013	5	0.2	0.27
Methoxychlor	12	1		0.069					

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5581.5

Table B-17: Summary of Fish Tissue Results

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 131									
beta-BHC	9	1		0.006		0.007			
delta-BHC	7	1		0.003					
Endosulfan I	7	1		0.002		42.93			
Endosulfan Sulfate	7	1		0.002					
p,p' DDE	9	5	0.004	0.015	0.022	0.0013	5	0.2	0.27
p,p' DDD	9	2	0.003	0.006	0.008	0.0013	5	0.2	0.27

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5582.5

Table B-18: Summary of Fish Tissue Results

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 147									
beta-BHC	8	1		0.002		0.007			
delta-BHC	8	2	0.002	0.003	0.003				
Heptachlor	8	5	0.002	0.003	0.005	0.003	0.3	0.2	0.21
Heptachlor Epoxide	8	1		0.002			0.3	0.2	0.21
Endosulfan I	8	3	0.002	0.002	0.003	42.93			
Aldrin	8	1		0.004		0.00037	0.3	0.12	0.022
Dieldrin	8	1		0.002		0.00036	0.3	0.12	0.022
Endrin	8	2	0.002	0.002	0.002		0.3	0.025	
p,p' DDE	8	4	0.006	0.025	0.044	0.0013	5	0.2	0.27
p,p' DDD	8	2	0.002	0.002	0.002	0.0013	5	0.2	0.27
p,p' DDT	8	1		0.005		0.0013	5	0.2	0.27
Chlordane	8	1		0.025		0.0068	0.3	0.5	0.37
Toxaphene	8	1		0.025		0.0096	5		

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5583.5

Table B-19: Summary of Fish Tissue Results

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 161									
delta-BHC	8	1		0.006					
Heptachlor	8	4	0.003	0.006	0.008	0.003	0.3	0.2	0.21
Heptachlor Epoxide	8	1		0.002			0.3	0.2	0.21
Aldrin	8	1		0.003		0.00037	0.3	0.12	0.022
Dieldrin	8	3	0.002	0.002	0.003	0.0036	0.3	0.12	0.022
Endrin	8	1		0.002			0.3	0.025	
p,p' DDE	8	2	0.022	0.023	0.023	0.0013	5	0.2	0.27
p,p' DDD	8	1		0.003		0.0013	5	0.2	0.27
p,p DDT	8	1		0.007		0.0013	5	0.2	0.27

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5584.5

Table B-20: Summary of Fish Tissue Results

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Johnson Creek									
beta-BHC	16	3	0.003	0.003	0.005	0.007			
p,p' DDE	16	16	0.005	0.014	0.160	0.0013	5	0.2	0.27
p,p' DDD	16	4	0.003	0.005	0.048	0.0013	5	0.2	0.27
p,p' DDT	16	8	0.004	0.018	0.220	0.0013	5	0.2	0.27

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5583.5

Table B-21: Summary of Fish Tissue Results

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Conser Slough									
Dieldrin	5	2	0.004	0.004	0.004	0.00036	0.3	0.12	0.022
Endrin	5	2	0.004	0.004	0.004		0.3	0.025	
Methoxychlor	5	5	0.003	0.003	0.003				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5585.5

Table B-22: Summary of Fish Tissue Results

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mid Fork Willamette River — River Mile 8									
Heptachlor	6	2	0.004	0.006	0.007	0.003	0.3	0.2	0.21
Endrin	6	1		0.002			0.3	0.25	

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5586.5

Table B-23: Summary of Fish Tissue Results — PCB Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 7									
3,3'4,4' TCBP	6	3	0.007	0.011	0.037	0.0025	2	0.11	
2,3,3',4,4' PeCBP	6	1		0.006		0.0025	2	0.11	
3,3'4,4'5 PeCBP	6	2	0.006	0.014	0.021	0.0025	2	0.11	
Arochlor 1242	12	1		0.119		0.0025	2	0.11	
Arochlor 1254	12	1		0.160		0.0025	2	0.11	
Arochlor 1260	12	5	0.044	0.096	1.403	0.0025	2	0.11	

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5587.5

Table B-24: Summary of Fish Tissue Results — PCB Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 27									
Arochlor 1254	4	1		0.205		0.0025	2	0.11	
Arochlor 1260	4	1		0.119		0.0025	2	0.11	

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5588.5

Table B-25: Summary of Fish Tissue Results — PCB Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 38									
Arochlor 1260	4	1		0.015		0.0025	2	0.11	

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5589.5

Table B-26: Summary of Fish Tissue Results — PCB Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 48									
Arochlor 1254	6	1		0.109		0.0025	2	0.11	
Arochlor 1260	6	1		0.062		0.0025	2	0.11	

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5590.5

Table B-27: Summary of Fish Tissue Results — PCB Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 74									
3,3'4,4' TCBP	6	3	0.002	0.003	0.005	0.0025	2	0.11	
Arochlor 1260	12	3	0.026	0.035	0.058	0.0025	2	0.11	

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5591.5

Table B-28: Summary of Fish Tissue Results — PCB Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 131									
3,3'4,4'TCBP	6	1		0.002		0.0025	2	0.11	

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5592.5

Table B-29: Summary of Fish Tissue Results — PCB Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 147									
3,3'4,4' TCBP	8	2	0.003	0.003	0.003	0.0025	2	0.11	
Arochlor 1260	8	1		0.028		0.0025	2	0.11	

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5593.5

Table B-30: Summary of Fish Tissue Results — PCB Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 161									
3,3'4,4' TCBP	8	3	0.003	0.003	0.004	0.0025	2	0.11	
3,3'4,4'5 PeCBP	8	2	0.002	0.004	0.005	0.0025	2	0.11	
Arochlor 1260	8	3	0.033	0.046	0.085	0.0025	2	0.11	

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5594.5

Table B-31: Summary of Fish Tissue Results — PCB Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Conser Slough									
Arochlor 1242	6	2	0.025	0.234	0.242	0.0025	2	0.11	
Arochlor 1260	8	1		0.132		0.0025	2	0.11	

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.
NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5595.5

Table B-32: Summary of Fish Tissue Results — PCB Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Mid Fork Willamette River — River Mile 8									
3,3'4,4' TCBP	6	4	0.003	0.007	0.011	0.0025	2	0.11	
2,3,3'4,4' PeCBP	6	3	0.002	0.003	0.004	0.0025	2	0.11	
3,3'4,4'5 PeCBP	6	2	0.004	0.006	0.007	0.0025	2	0.11	
Arochlor 1260	6	3	0.074	0.112	0.131	0.0025	2	0.11	

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5596.5

Table B-33: Summary of Whitefish Results — TCDD, TCDF, TEC Range & Medians

Parameter	Location	Number of		Minimum	Median	Maximum	EPA/TV	FDA Guidance Value	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
		Samples	Detects							
1990 — 1991										
TCDD	US RM 147	5	4	0.27	0.53	0.87	0.07	25	3.0	2.3
	DS RM 147	7	7	1.4	2.7	7.9	0.07	25	3.0	2.3
TCDF	US RM 147	5	5	1.7	2.55	4				
	DS RM 147	7	7	4.6	13	22				
TEC	US RM 147	5	5	0.21	1.24	3	0.07	25	3.0	2.3
	DS RM 147	7	7	2.18	4.01	10.9	0.07	25	3.0	2.3

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.
NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.
TCDD = 2,3,7,8 tetrachlorodibenzo-p-dioxin.
TCDF = 2,3,7,8 tetrachlorodibenzofuran.
TEC = Toxic Equivalency Concentration (calculated form detected values).
US RM 147 = Upstream of rive mile 147 of the mainstem Willamette River.
DS RM 147 = Downstream of river mile 147 of the mainstem Willamette River.

SA\WH5597.5

Table B-34: Summary of Whitefish Results — TCDD, TCDF, TEC Range & Medians

Parameter	Location	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
		Samples	Detects							
1990										
TCDD	US RM 147	4	3	0.49	0.57	0.87	0.07	25	3.0	2.3
	DS RM 147	4	4	2.7	3.7	7.9	0.07	25	3.0	2.3
TCDF	US RM 147	4	4	2.1	2.55	4				
	DS RM 147	4	4	13	17.5	30				
TEC	US RM 147	4	4	0.21	1.7	3	0.07	25	3.0	2.3
	DS RM 147	4	4	4.01	6.27	10.9	0.07	25	3.0	2.3
1991										
TCDD	US RM 147	1	1		0.27		0.07	25	3.0	2.3
	DS RM 147	3	3	1.4	1.9	2.5	0.07	25	3.0	2.3
TCDF	US RM 147	1	1		1.7					
	DS RM 147	3	3	4.6	6.6	8.3				
TEC	US RM 147	1	1		0.77		0.07	25	3.0	2.3
	DS RM 147	3	3	2.18	3.04	3.85	0.07	25	3.0	2.3

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.
NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.
TCDD = 2,3,7,8 tetrachlorodibenzo-p-dioxin.
TCDF = 2,3,7,8 tetrachlorodibenzofuran.
TEC = Toxic Equivalency Concentration (calculated form detected values).
US RM 147 = Upstream of rive mile 147 of the mainstem Willamette River.
DS RM 147 = Downstream of river mile 147 of the mainstem Willamette River.

SA\WH5598.5

Table B-35: Summary of Carp Results — TCDD, TCDF, TEC Range & Medians

Parameter	Location	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
		Samples	Detects							
TCDD	US RM 147	1	1		0.41		0.07	25	3.0	2.3
	DS RM 147	3	3	0.44	0.45	0.57	0.07	25	3.0	2.3
TCDF	US RM 147	1	1		0.41					
	DS RM 147	3	3	0.45	0.54	0.56				
TEC	US RM 147	1	1		1.39		0.07	25	3.0	2.3
	DS RM 147	3	3	-0.78	0.93	1.02	0.07	25	3.0	2.3

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.
NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.
TCDD = 2,3,7,8 tetrachlorodibenzo-p-dioxin.
TCDF = 2,3,7,8 tetrachlorodibenzofuran.
TEC = Toxic Equivalency Concentration (calculated form detected values).
US RM 147 = Upstream of rive mile 147 of the mainstem Willamette River.
DS RM 147 = Downstream of river mile 147 of the mainstem Willamette River.

SA\WH5599.5

Table B-36: Summary of Tissue Results — Metals Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 7									
Cadmium	5	1		0.020					
Copper	5	5	0.16	0.560	0.78				
Lead	5	1		0.030					
Mercury	5	5	0.11	0.170	0.19	1	1		
Zinc	5	5	8.13	10.150	12.47				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.
NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5600.5

Table B-37: Summary of Tissue Results — Metals Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 27									
Copper	4	4	0.13	0.195	0.24				
Mercury	4	4	0.1	0.270	0.46	1	1		
Zinc	4	4	4.85	5.390	7.28				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5601.5

Table B-38: Summary of Tissue Results — Metals Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 28									
Cadmium	3	1		0.02					
Chromium	3	1		0.04		54928*			
Copper	3	3	0.41	0.420	0.54				
Mercury	3	3	0.14	0.150	0.16	1	1		
Zinc	3	3	6.7	10.480	14.56				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

* = Value for Chromium III.

SA\WH5602.5

Table B-39: Summary of Tissue Results — Metals Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 38									
Copper	4	4	0.19	0.220	0.31				
Mercury	4	4	0.11	0.130	0.23	1	1		
Zinc	4	4	5.1	6.870	16.28				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5603.5

Table B-40: Summary of Tissue Results — Metals Analysis

Parameter	Number of Samples	Number of Detects	Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
Willamette River — River Mile 48									
Arsenic	4	1		0.100					
Copper	4	4	0.15	0.195	0.33				
Mercury	4	4	0.1	0.180	0.44	1	1		
Zinc	4	4	4.65	5.940	9.9				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5604.5

Table B-41: Summary of Tissue Results — Metals Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Willamette River — River Mile 74									
Copper	3	3	0.36	0.390	0.54				
Mercury	3	3	0.12	0.120	0.2	1	1		
Zinc	3	3	5.91	6.540	9.11				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5605.5

Table B-42: Summary of Tissue Results — Metals Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Johnson Creek									
Barium	8	8	2.37	4.645	7.22				
Cadmium	8	8	0.02	0.02	0.06				
Chromium	8	5	0.04	0.06	0.08	54928*			
Copper	8	8	10.5	16.490	19.89				
Lead	8	6	0.05	0.085	0.18				
Mercury	8	8	0.03	0.090	0.14	1	1		
Zinc	8	8	15.04	18.050	19.87				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

* = Value for Chromium III.

SA\WH5606.5

Table B-43: Summary of Tissue Results — Metals Analysis

Parameter	Number of		Minimum	Median	Maximum	EPA/TV	FDA Action Level	NYS/DEC Non-Carcinogenic	NYS/DEC Carcinogenic
	Samples	Detects							
Conser Slough									
Copper	5	5	0.17	0.280	0.36				
Mercury	5	5	0.08	0.280	0.49	1	1		
Zinc	5	5	4.73	5.570	6.33				

LEGEND:

Units = mg/kg-wet weight.

Median values calculated from samples with detectable concentrations.

EPA/TV = Threshold values derived from USEPA water quality criteria.

NYS/DEC = Values derived for the protection of wildlife by New York State Department of Environmental Conservation.

SA\WH5607.5

APPENDIX C

Tables — Sediment Data

TABLE OF CONTENTS

Summary: Sediment Metals Analyses

River	Station	River Mile	Date	Metals (mg/kg)						
				Total Arsenic	Total Cadmium	Total Chromium	Total Copper	Total Lead	Total Mercury	Total Zinc
1988 — 1989 Analytical Results										
Willamette	St. John's Bridge	6	10-Aug-88	45.5	0.9	43.2	47.5	35.7	0.03	159
	SP&S Bridge	7 North	26-Oct-89	4.47	0.07j	11.9	15.7	19j	0.034	75.9
		7 South	26-Oct-89	4.99	0.16j	22	19.2	23.5	0.087	87
			15-Aug-88	18.6	0.5u	20.4	31.1	33.9	0.03	121
	Doane Lake	7	10-Aug-88	54	0.5u	32.9	53.9	25.2	0.13	160
	Swan Island	8	26-Oct-89	5.39	0.617	27.5	197	35.1	0.092	214
		8,1A	26-Jan-88	3.9	0.5u	31.1	89.1	20.6	0.106	231
		8,1B	26-Jan-88	4.6	0.5u	38.8	101	30.5	0.139	272
		8,2A	26-Jan-88	14.5	0.5u	90.8	320	151	1.74	703
	Ross Island	14	26-Oct-89	2.33.	0.092j	18.9	14.6	12.4	0.033	73.2
	Sellwood Bridge	16	15-Aug-88	14.8	0.5u	25.3	32.3	22.8	0.03	107
	Johnson Creek	18	26-Oct-89	2.98	0.13j	26.7	20.6	20j	0.03	72.3
	DS Oregon City	27	25-Oct-89	3.73	0.19j	32.9	25.6	8.5j	0.034	75.6
			10-Aug-88	42.6	0.5u	26	28	5.7	0.008u	70.5
	Wilsonville	38	04-Oct-89	2.62	0.19j	28.2	26	11j	0.028	71.8
			15-Aug-88	18	0.5u	20.6	23.4	13.6	0.008u	72.6
	Newberg Pool	47	25-Oct-89	2.97	0.12j	28.5	23.7	13j	0.018	63.8
	Newberg	48	15-Aug-88	19.7	0.5u	17.6	20.6	11.1	0.008u	62.5
	US Newberg Pool	52	25-Oct-89	3.16	0.18j	24.6	22.6	9.9j	0.034	67.6
Columbia Slough	BL Mouth of North Slough	1	26-Oct-89	4.41	0.285	14.9	7.99	16j	0.031	69.4
			15-Aug-88	21.2	1.4	38.9	44.7	60	0.05	187
	Dump Road	2	15-Aug-88	13	0.5	19.4	19.5	52.6	0.05	142
	Denver Avenue	5	15-Aug-88	26.6	2.1	61.4	65.8	118	0.1	324
Tualatin	Tualatin	8	27-Oct-89	3.98	0.54	31.5	21	21.6j	0.048	109
			14-Nov-88	2.8	0.5	19.2	30.5	28	0.014	86.4
Fanno Creek	—	2	15-Nov-89	3.86	0.592	21.2	17.7	29.6	0.041	149
			09-Nov-88	3.4	0.5	22.2	19.4	36	0.015	148
Beaverton Creek	—	4	15-Nov-89	8.77	4.5J	186	331	283	0.3	398
			09-Nov-88	3.1	0.5	32.7	47.8	50.7	0.062	114
Yamhill	—	5	27-Oct-89	5.25	0.234	29.8	25.8	11j	0.018	80.3
			15-Aug-88	29.6	0.5u	27.2	39.4	17.1	0.008u	87
Conser Slough	—	0.1	05-Oct-89	3.39	0.16j	25.3	20.5	15j	0.065	74.7

LEGEND:

u = Material was analyzed for but not detected.
j = Estimated value; value not accurate.

SA\WII5566.5 (03/94)

Summary: Sediment Pesticide Analyses

River	Station	River Mile	Sample Date	Chemicals																				
				alpha BHC (mg/kg)	beta BHC (mg/kg)	Delta BHC (mg/kg)	Lindane (mg/kg)	Heptachlor (mg/kg)	Heptachlor Epoxide (mg/kg)	Endosulfan I (mg/kg)	Endosulfan II (mg/kg)	Endosulfan Sulfate (mg/kg)	Aldrin (mg/kg)	Dieldrin (mg/kg)	Endrin (mg/kg)	Endrin Aldehyde (mg/kg)	p,p' DDE (mg/kg)	p,p' DDD (mg/kg)	p,p' DDT (mg/kg)	Methoxychlor (mg/kg)	Chlordane (mg/kg)	Toxaphene (mg/kg)	TOC (mg/kg - Wet)
Willamette	St. John's Bridge	8	10-Aug-88	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.008	0.035	0.006	0.012u	0.012u	0.18u	5100
	SP&S Bridge	7	23 Aug 90	0.005u	0.018	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.009	0.005u	0.005u	0.025u	0.025u	7040
			23 Aug 90	0.006	0.007	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.008	0.005u	0.005u	0.025u	0.025u	6410
			23 Aug 90	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.008	0.005u	0.005u	0.025u	0.025u	8970
		7 North	26 Oct 89	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.12u	5000
		7 South	26 Oct-89	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.08j	0.08j	1.64j	0.012u	0.012u	0.36u	12000
			15 Aug 88	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.084	0.49	0.16	NA	0.003u	0.045u	41900
	Doane Lake	7	10-Aug-88	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.27	1.4	0.021	0.012u	0.012u	0.18u	29900
	Pennwalt																							
	Swan Island	8	26 Oct 89	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.014j	0.018j	0.019j	0.008u	0.008u	0.225u	8000
		8,1A	26-Jan-88	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.018u	0.018u	0.009u	0.018u	0.018u	0.018u	0.018u	0.018u	0.018u	0.02u	0.027u	0.14u	
		8,1B	26-Jan-88	0.011u	0.011u	0.011u	0.011u	0.016u	0.016u	0.016u	0.016u	0.016u	0.011u	0.016u	0.016u	0.016u	0.012n	0.018n	0.016u	0.022u	0.022u	0.16u	
		8,2A	26-Jan-88	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.04u	0.04u	0.04u	0.02u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.08u	0.08u	0.8u	
	Ross Island	14	26 Oct-89	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.014u	2000
	Sellwood Bridge	16	15 Aug 88	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	NA	0.003u	0.045u	37900
	Johnson Creek	18	26 Oct 89	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.15u	22000
	Down Stream Oregon City	27	25 Oct 89	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.185u	
			10 Aug 88	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.006u	0.006u	0.09u	6200
	Up Stream Oregon City	28	25-Oct-89																				29000
	Wilsonville	38	04-Oct-89	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.15u	
			15 Aug 88	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	NA	0.003u	0.003u	8100
	Newberg Pool	47	25 Oct 89	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.018u	29000
	Newberg	48	15 Aug 88	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	NA	0.003u	0.039u	18800

Summary: Sediment Pesticide Analyses *(Continued)*

River	Station	River Mile	Sample Date	Chemicals																				
				alpha BHC (mg/kg)	beta BHC (mg/kg)	Delta BHC (mg/kg)	Lindane (mg/kg)	Heptachlor (mg/kg)	Heptachlor Epoxide (mg/kg)	Endosulfan I (mg/kg)	Endosulfan II (mg/kg)	Endosulfan Sulfate (mg/kg)	Aldrin (mg/kg)	Dieldrin (mg/kg)	Endrin (mg/kg)	Endrin Aldehyde (mg/kg)	p,p' DDE (mg/kg)	p,p' DDD (mg/kg)	p,p' DDT (mg/kg)	Methoxychlor (mg/kg)	Chlordane (mg/kg)	Toxaphene (mg/kg)	TOC (mg/kg – Wet)
Willamette *(Continued)*	Upstream Newberg Pool	52	25-Oct-89	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.24u	49000
	Wheatland Ferry	74	29 Aug 90	0.00025u	0.00025u	0.00025u	0.00025u	0.0005u	0.00025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	5.00u	0.0025u	0.0065u	
	Corvallis	131	29 Aug 90	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.025u	0.025u	2960
				0.005u	0.005u	0.005u	0.005u	0.006u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.025u	0.025u	1840
	Halsey	147	24-Aug-90	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.025u	0.025u	2560
				0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.025u	0.025u	1000
				0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.025u	0.025u	2320
	Harrisburg	161	24-Aug 90	0.005u	0.008	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.025u	0.025u	8010
				0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.025u	0.025u	3910
				0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.025u	0.025u	3250
Mid Fork Willamette	Jasper	8	24 Aug 90	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.025u	0.025u	5160
				0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.025u	0.025u	6940
				0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.025u	0.025u	1720
Johnson Creek	Ochoco Avenue	1.1	06-Feb-91	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0083u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.023	0.013u	0.063u	0.16u	NA
	82nd Avenue	5.8		0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.018	0.011	0.075	0.013u	0.063u	0.16u	NA
	Regnar Road	16.2	06 Feb 91	0.0063u	0.0063	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.045	0.13	0.069	0.51	0.013u	0.063u	0.16u	NA
	Palmblad Avenue	17.5	06 Feb 91	0.0063u	0.0063	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.0063u	0.025	0.014	0.067	0.013u	0.063u	0.16u	NA
Columbia Slough	Bl. Mouth of North Slough	1	26 Oct-89	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.14u	2000
			15-Aug 88	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.014u	0.019	0.004u	NA	0.004u	0.06u	46700
			31-Aug 90																				8220
																							7650
																							960
	Dump Road	2	15-Aug 88	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.003	0.012	0.002u	NA	0.002u	0.03u	19600

Summary: Sediment Pesticide Analyses *(Continued)*

River	Station	River Mile	Sample Date	Chemicals																				
				alpha BHC (mg/kg)	beta BHC (mg/kg)	Delta BHC (mg/kg)	Lindane (mg/kg)	Heptachlor (mg/kg)	Heptachlor Epoxide (mg/kg)	Endosulfan I (mg/kg)	Endosulfan II (mg/kg)	Endosulfan Sulfate (mg/kg)	Aldrin (mg/kg)	Dieldrin (mg/kg)	Endrin (mg/kg)	Endrin Aldehyde (mg/kg)	p,p' DDE (mg/kg)	p,p' DDD (mg/kg)	p,p' DDT (mg/kg)	Methoxychlor (mg/kg)	Chlordane (mg/kg)	Toxaphene (mg/kg)	TOC (mg/kg — Wet)
Columbia Slough *(Continued)*	Denver Avenue	5	15-Aug 88	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.021	0.033	0.005u	NA	0.005u	0.072u	70600
Tualatin River	Tualatin	8	27-Oct-89	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.15u	21000
			14-Nov-88	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.008u	0.003m	0.003m	NA	0.003u	0.039u	
Fanno Creek	Tualatin	2	15-Nov-89	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.18u	
Fanno Creek	Tualatin	2	09-Nov 88	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.006u	0.002m	0.002m	NA	0.002u	0.033u	
Beaverton Creek	—	4	15-Nov-89	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.046j	0.28j	0.034j	0.009u	0.009u	0.27u	
			09-Nov-88	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.005	0.016	0.002	NA	0.002u	0.03u	
Yamhill River	—	5	27-Oct-89	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.14u	3000
			15-Aug 88	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	NA	0.002u	0.036u	41100
Canser Slough	—	0.1	05-Oct-89	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.014j	0.006u	0.013j	0.006u	0.006u	0.18u	19000

LEGEND:

u = Material was analyzed for but not detected.
j = Estimated value; value not accurate.
m = Presence of material verified but not quantified.
NA = *Not Analyzed.*

SA\WH5667.3

Summary: Sediment PAH Analyses

River	Station	River Mile	Sample Date	Chemicals																						
				Naphthalene (mg/kg)	Azulene (mg/kg)	Acenaphthylene (mg/kg)	Acenaphthene (mg/kg)	Dibenzofuran (mg/kg)	Fluorene (mg/kg)	Dibenzothiophene (mg/kg)	Acridine (mg/kg)	Phenanthrene (mg/kg)	Anthracene (mg/kg)	Carbazole (mg/kg)	Fluoranthene (mg/kg)	Pyrene (mg/kg)	Retene (mg/kg)	Benzo(a) Anthracene (mg/kg)	Chrysene (mg/kg)	Benzo(b)Fluoranthene (mg/kg)	Benzo(k) Fluoranthene (mg/kg)	Perylene (mg/kg)	Benzo(e) Pyrene (mg/kg)	Indeno (1,2,3-cd) Pyrene (mg/kg)	Dibenz(a,h) Anthracene (mg/kg)	Benzo(ghi) Perylene (mg/kg)
Willamette River	St John's Bridge	8	10 Aug 88	100u	NA	200u	200u	NA	30u	NA	NA	10	4	NA	20	10u	NA	5	6	7	3	NA	8	6	10	9
	SP&S Bridge	7	23 Aug 90	30 2	0 26	0 41	14 8	11 4	3.16	3 16	3 16	27.8	8 3	0 03	17.4	15.5	0 94	2 95	2 9	2 06	1.32	1.15	0.34	0.44	0.18	0 41
				0 22	0 03u	0 03u	0 41	0 36	0.43	0 12	0 03u	1.36	0 13	0.03	0 6*	0 69	0 55	0 55	0 18	0.17	0.54	0 07	0 03u	0 03u	0 03u	0.03u
				0 25	0 03u	0 03u	0 03u	0 07	0 07	0 03u	0 03u	0 25	0.07	0.07	0.3<	0.37	0 18	0.18	0 18	0.11	0 04	0 03u	0.03u	0 03u	0 03u	0 03u
		7 North	26 Oct 89	0 13j	NA	0 26u	0 034j	0 0246j	0 261u	NA	NA	0 0696j	0 0287j	0 261u	0.134j	0.11j	0 0431j	0 0372j	0 0715j	0 261u	0 261u	NA	0 261u	0 261u	0 261u	0 0685u
		7 South	26 Oct 89	0 324j	NA	0 0311j	0 0718j	0 0345j	0 0645j	NA	NA	0 506j	0 101j	0 3	0 8*	0 788	0 82	0 23j	0 345	0 168j	0 206j	NA	0 215j	0 127j	0 3u	0 206j
			15 Aug 88	26u	NA	45u	NA	5 3u	5 3u	NA	NA	0 8	0 32	NA	2.6	2.3u	NA	1.1	1.3	1.8	0 51	NA	1.7	0 75u	1.5u	1.5u
	Doane Lake	3	10 Aug 88	2000u	NA	4000u	4000u	NA	500u	NA	NA	800	200	NA	900	500	NA	200	300	300	100	NA	300	300	500	200
	Pennwalt	7																								
	Swan Island	8	26 Oct 89	0 222j	NA	0 0518j	0 168j	0 0796j	0 1043	NA	NA	0.754	0.1j	0.465u	1.14	0.777	0 852	0 31j	0 497	0 476	0 26j	NA	0 369j	0 273j	0 187j	0 461j
		8.1A																								
		8.1B	26 Jan 88																							
		8.2a																								
	Ross Island	14	26 Oct 89	0 0083j	NA	0 268u	0 268u	0 268u	0 268u	NA	NA	0 0077j	0 268u	0 268u	0 0067j	0 0054j	0 0444j	0 268u	0 268u	0 268u	0 268u	NA	0 268u	0 268u	0 268u	0 268u
	Sellwood Bridge	16	15 Aug 88	0 52u	NA	0 89u	0 89u	NA	0.1u	NA	NA	0.19	0 03	NA	0.2<	0 14	NA	0 05	0 03	0.15	0 02	NA	0.05	0 07	0 03u	0.16
	Johnson Creek	18	26 Oct 89	0 0293j	NA	0 298u	0 298u	0 298u	0 298u	NA	NA	0 0256j	0 298u	0 298u	0 0559j	0 0677j	0 151j	0 0233j	0 043j	0 298j	0 298j	NA	0 298u	0 298u	0 298u	0 298u
	Downstream Oregon City	27	25 Oct 89	0 0423j	NA	0 381u	0 381u	0 381u	0 381u	NA	NA	0 0412j	0 381u	0 381u	0 0854j	0 074j	0 29j	0 0217j	0 035j	0 381u	0 381u	NA	0 381u	0 381u	0 381u	0 381u
			10 Aug 88	1.9u	NA	3.2u	3.2u	NA	0.4	NA	NA	0 04	0 02	NA	0 08	0.16u	NA	0 03	0 03j	0 08	0 03	NA	0 07	0 05u	0.1u	0.1u
	Upstream Oregon City	28																								
	Willamette Park	30	04 Oct 89	0 0539j	NA	0 0094j	0 0053j	0 355u	0 355u	NA	NA	0 0496j	0 355u	NA	0 0551j	0 0488j	0 29j	0 355u	0 355u	0 355u	0 355u	NA	0 355u	0 355u	0 355u	0 355u
			15 Aug 88	0 44u	NA	0 76u	0 76u	NA	0 09u	NA	NA	0 03	0 005	NA	0 0*	0 04u	NA	0 008	0 006j	0 06	0 003	NA	0 008	0 01j	0 03u	0 023u
	Newberg Pool	47	25 Oct 89	0 0525j	NA	0 0126j	0 355u	0 355u	0 355u	NA	NA	0 0373j	0 355u	0 355u	0 0381j	0 048j	0 837j	0 355u	0 0166j	0 355u	0 355u	NA	0 355u	0 355u	0 355u	0 355u
	Newberg	48	15 Aug 88	0 47u	NA	0 81u	0 81u	NA	0 09u	NA	NA	0 05	0 006	NA	0 0*	0 04u	NA	0 007u	0 007j	0.1	0 003	NA	0 007j	0 01u	0 03u	0 03u
	Upstream Newberg Pool	52	25 Oct 89	0 511u	NA	0 511u	0 511u	0 511u	0 511u	NA	NA	0 511u	0 511u	0 511u	0 511u	0 048j	0 838j	0 511u	0 511u	0 511u	0 511u	NA	0 511u	0 511u	0 511u	0 511u
	Wheatland Ferry	74	29 Aug 90	0 05u	NA	0 05u	0 05u	0 05u	0 05u	0 05u	NA	0 05u	0 05u	NA	0 05u	0 05u	NA	0 05u	0 05u	0 32	0 14	0 05u	0 12	0 05u	0 05u	0 11
				0 05u	NA	0 05u	0 05u	0 05u	0 05u	0 05u	NA	0 05u	0 05u	NA	0 05u	0 05u	NA	0 05u	0 05u	0 05u	0 05u	0 05u	0 05u	0 05u	0 05u	0 05u

Summary: Sediment PAH Analyses *(Continued)*

River	Station	River Mile	Sample Date	Chemicals																							
				Naphthalene (mg/kg)	Azulene (mg/kg)	Acenaphthylene (mg/kg)	Acenaphthene (mg/kg)	Dibenzofuran (mg/kg)	Fluorene (mg/kg)	Dibenzothiophene (mg/kg)	Acridine (mg/kg)	Phenanthrene (mg/kg)	Anthracene (mg/kg)	Carbazole (mg/kg)	Fluoranthene (mg/kg)	Pyrene (mg/kg)	Retene (mg/kg)	Benz(a) Anthracene (mg/kg)	Chrysene (mg/kg)	Benzo(b)Fluoranthene (mg/kg)	Benzo(k) Fluoranthene (mg/kg)	Perylene (mg/kg)	Benzo(a) Pyrene (mg/kg)	Indeno (1,2,3-cd) Pyrene (mg/kg)	Dibenz(a,h) Anthracene (mg/kg)	Benzo(ghi) Perylene (mg/kg)
Willamette River (Continued)	Corvallis	131	20 Aug 90	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
				0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
	Halsey	147	24 Aug 90	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
				0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
	Harrisburg	161	24 Aug 90	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.08	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u
				0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u	0.04u
				0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
Mid Fork Willamette	Jasper	8	24 Aug 90	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
				0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
				0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
Columbia Slough	Bl. Mouth of North Slough	1	26 Oct 89	0.033j	NA	0.273u	0.273u	0.273u	0.273u	NA	NA	0.0498j	0.273u	0.273u	0.0535j	0.0558j	0.273u	0.273u	0.107j	0.0715j	0.0575j	NA	0.273j	0.273u	0.273u	0.273u	0.273u
			15 Aug 88	27u	NA	64u	64u	NA	7.5u	NA	NA	0.88	0.11j	NA	1.1u	3.2u	NA	0.53u	0.53u	0.93	0.24	NA	0.53j	1.1u	2.1u	2.1u
	Quarry Road	2	15 Aug 88	19	NA	33	33	NA	3.9u	NA	NA	0.52	0.12	NA	0.95	1.7u	NA	0.56	0.51	1.2	0.37	NA	0.89	1.1	1.1u	2.3
	Denver Avenue	5	15 Aug 88	42u	NA	71u	71u	NA	8.3u	NA	NA	0.59u	0.12u	NA	1.2u	3.6u	NA	0.59u	0.59u	0.78	0.19	NA	0.59u	1.2u	2.4u	2.4u
Tualatin River	Tualatin	8	27 Oct 89	0.34u	NA	0.34u	0.34u	0.34u	0.34u	NA	NA	0.0402j	0.34u	0.34u	0.132j	0.14j	0.122j	0.0344j	0.0694j	0.34u	0.34u	NA	0.34u	0.34u	0.34u	0.34u
			14 Nov 88	0.89u	NA	1.5u	1.5u	NA	0.18u	NA	NA	0.095j	0.0076j	NA	0.095j	0.078j	NA	0.013u	0.025j	0.14j	0.041j	NA	0.013u	0.025u	0.053u	0.051u
Fanno Creek		2	15 Nov 88	0.371u	NA	0.371u	0.371u	0.371u	0.371u	NA	NA	0.371u	0.371u	0.371u	0.371u	0.063u	0.192j	0.371u	0.371u	0.371u	0.371u	NA	0.371u	0.371u	0.371u	0.371u
			09 Nov 88	0.75u	NA	1.3u	1.3u	NA	0.15u	NA	NA	0.19	0.0043	NA	0.58	0.8	NA	0.085	0.032	0.12	0.024	NA	0.032	0.052	0.043u	0.11
Beaverton Creek		4	15 Nov 88	0.0357j	NA	0.582u	0.582u	0.582u	0.582u	NA	NA	0.122j	0.582u	0.582u	0.235j	0.361j	0.582u	0.06j	0.188nj	0.582u	0.582u	NA	0.582u	0.224j	0.163j	0.274j
			09 Nov 88	0.67u	NA	1.2u	1.2u	NA	0.13u	NA	NA	0.021	0.002u	NA	0.044	0.058u	NA	0.0096j	0.0096j	0.054	0.012	NA	0.017	0.029	0.038u	0.038u
Tualhill River		5	27 Oct 89	0.0156j	NA	0.282u	0.282u	0.282u	0.282u	NA	NA	0.282u	0.282u	0.282u	0.028j	0.0245j	0.414	0.282u	0.282u	0.282u	0.282u	NA	0.282u	0.282u	0.282u	0.282u
			15 Aug 88	0.4	NA	0.89u	0.89u	NA	0.08u	NA	NA	0.01u	0.001j	NA	0.02	0.04u	NA	0.007	0.008	0.03	0.004	NA	0.008	0.01u	0.02u	0.02u
Cooper Slough		0.1	05 Oct 89	0.0443j	NA	0.355u	0.0093j	0.355u	0.355u	NA	NA	0.0954j	0.355u	0.355u	0.0865j	0.116j	0.108j	0.355u	0.0213j	0.355u	0.355u	NA	0.355u	0.355u	0.355u	0.355u

LEGEND:

u = Material was analyzed for but not detected. j = Estimate value; value not accurate. NA = Not analyzed.

SAIWII5722.5

Summary: Sediment PCB Analyses

River	Station	River Mile	Sample Date	Chemicals									
				3,3'4,4' TCBP (mg/kg)	2,3,3',4,4'PCBP (mg/kg)	3,3',4,4'5 PCBP (mg/kg)	3,3',4,4',5,5' HCBP (mg/kg)	PCB 1 (1221) (mg/kg)	PCB 2 (1232) (mg/kg)	PCB 3 (1242) (mg/kg)	PCB 4 (1254) (mg/kg)	PCB5 (1260) (mg/kg)	TOC (mg/kg – Wet)
Willamette	St. John's Bridge	6	10-Aug-88	NA	NA	NA	NA	0.06u	0.06u	0.06u	0.06u	0.35	5100
	SP&S Bridge	7	12-Jun-90	0.005u	0.005u	0.005u	0.005u	0.125u	0.005u	0.025u	0.025u	0.003u	7040
			12-Jun-90	0.005u	0.005u	0.005u	0.005u	0.125u	0.005u	0.025u	0.025u	0.003u	6410
			12-Jun-90	0.005u	0.005u	0.005u	0.005u	0.125u	0.005u	0.025u	0.025u	0.003u	8970
		7 North	26-Oct-89	NA	NA	NA	NA	0.04u	0.04u	0.04u	0.04u	0.04u	5000
		7 South	26-Oct-89	NA	NA	NA	NA	0.12u	0.12u	0.12u	0.12u	0.12u	12000
			15-Aug-88	NA	NA	NA	NA	0.015u	0.015u	0.015u	0.015u	0.015u	41900
	Doane Lake	7	10-Aug-88	NA	NA	NA	NA	0.06u	0.06u	0.06u	0.06u	0.05	29900
	Pennwalt	7											
	Swan Island	8	26-Oct-89	NA	NA	NA	NA	0.045u	0.045u	0.045u	0.25j	0.045u	
		8,1A	26-Jan-88	NA	NA	NA	NA	0.05u	0.05u	0.05u	0.05u	0.26	
		8,1B	26-Jan-88	NA	NA	NA	NA	0.05u	0.05u	0.05u	0.05u	0.05u	
		8,2A	26-Jan-88	NA	NA	NA	NA	0.2u	0.2u	0.2u	4.2	0.2u	
	Ross Island	14	26-Oct-89	NA	NA	NA	NA	0.045u	0.045u	0.045u	0.045u	0.045u	2000
	Sellwood Bridge	16	15-Aug-88	NA	NA	NA	NA	0.015u	0.015u	0.015u	0.015u	0.015u	37900
	Johnson Creek	18	16-Oct-89	NA	NA	NA	NA	0.05u	0.05u	0.05u	0.05u	0.05u	22000
	Down Stream Oregon City	27	25-Oct-89	NA	NA	NA	NA	0.062u	0.062u	0.062u	0.062u	0.062	
			10-Aug-88	NA	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	6200
	Up Stream Oregon City	28											29000
	Wilsonville	38	04-Oct-89	NA	NA	NA	NA	0.05u	0.05u	0.05u	0.05u	0.05u	
			15-Aug-88	NA	NA	NA	NA	0.013u	0.013u	0.013u	0.013u	0.013u	6100
	Newberg Pool	47	25-Oct-89	NA	NA	NA	NA	0.06u	0.06u	0.06u	0.06u	0.06u	19000
	Newberg	48	15-Aug-88	NA	NA	NA	NA	0.013u	0.013u	0.013u	0.013u	0.013u	18800

Summary: Sediment PCB Analyses *(Continued)*

River	Station	River Mile	Sample Date	Chemicals									
				3,3'4,4' TCBP (mg/kg)	2,3,3',4,4'PCBP (mg/kg)	3,3',4,4'5 PCBP (mg/kg)	3,3',4,4',5,5' HCBP (mg/kg)	PCB 1 (1221) (mg/kg)	PCB 2 (1232) (mg/kg)	PCB 3 (1242) (mg/kg)	PCB 4 (1254) (mg/kg)	PCB5 (1260) (mg/kg)	TOC (mg/kg – Wet)
Willamette *(Continued)*	Upstream Newberg Pool	52	25-Oct-89	NA	NA	NA	NA	0.08u	0.08u	0.08u	0.08u	0.08u	49000
	Wheatland Ferry	74	29-Aug-90	NA	NA	NA	NA	0.025u	0.1u	0.053	0.05u	0.05u	
			29-Aug-90	NA	NA	NA	NA	0.025u	0.1u	0.05u	0.05u	0.05u	
	Corvallis	131	12-Jun-90	0.005u	0.005u	0.005u	0.005u	0.125u	0.05u	0.025u	0.025u	0.003u	2960
				0.005u	0.005u	0.005u	0.005u	0.125u	0.05u	0.025u	0.025u	0.003u	1840
	Halsey	147	12-Jun-90	0.005u	0.005u	0.005u	0.005u	0.125u	0.05u	0.025u	0.025u	0.003u	2560
				0.005u	0.005u	0.005u	0.005u	0.125u	0.05u	0.025u	0.025u	0.003u	1000
				0.005u	0.005u	0.005u	0.005u	0.125u	0.05u	0.025u	0.025u	0.003u	2320
	Harrisburg	161	12-Jun-90	0.005u	0.005u	0.005u	0.005u	0.125u	0.05u	0.025u	0.025u	0.003u	8010
				0.005u	0.005u	0.005u	0.005u	0.125u	0.05u	0.025u	0.025u	0.003u	3910
				0.005u	0.005u	0.005u	0.005u	0.125u	0.05u	0.025u	0.025u	0.003u	3250
Mid Fork Willamette	Jasper	8	12-Jun-90	0.005u	0.005u	0.005u	0.005u	0.125u	0.05u	0.025u	0.025u	0.003u	5160
				0.005u	0.005u	0.005u	0.005u	0.125u	0.05u	0.025u	0.025u	0.003u	6940
				0.005u	0.005u	0.005u	0.005u	0.125u	0.05u	0.025u	0.025u	0.003u	1720
Johnson Creek	Ochoco Avenue	1.1	06-Feb-91										
	82nd Avenue	5.8											
	Regner Road	16.2	06-Feb-91										
	Palmblad Avenue	17.5	06-Feb-91										
Columbia Slough	Bl. Mouth of North Slough	1	26-Oct-89	NA	NA	NA	NA	0.045u	0.045u	0.045u	0.045u	0.045u	2000
			15-Aug-88	NA	NA	NA	NA	0.02u	0.02u	0.02u	0.075	0.02u	46700
	Dump Road	2	15-Aug-88	NA	NA	NA	NA	0.01u	0.01u	0.01u	0.089	0.01	19600
	Denver Avenue	5	15-Aug-88	NA	NA	NA	NA	0.024u	0.024u	0.024u	0.14	0.024u	70600

Summary: Sediment PCB Analyses *(Continued)*

River	Station	River Mile	Sample Date	Chemicals									
				3,3'4,4' TCBP (mg/kg)	2,3,3',4,4'PCBP (mg/kg)	3,3',4,4'5 PCBP (mg/kg)	3,3',4,4',5,5' HCBP (mg/kg)	PCB 1 (1221) (mg/kg)	PCB 2 (1232) (mg/kg)	PCB 3 (1242) (mg/kg)	PCB 4 (1254) (mg/kg)	PCB5 (1260) (mg/kg)	TOC (mg/kg – Wet)
Tualatin River	Tualatin	8	27-Oct-89	NA	NA	NA	NA	0.05u	0.05u	0.05u	0.05u	0.05u	21000
			14-Nov-88	NA	NA	NA	NA	0.013u	0.013u	0.013u	0.013u	0.013u	
Fanno Creek	—	2	15-Nov-89	NA	NA	NA	NA	0.06u	0.06u	0.06u	0.063j	0.06u	
			09-Nov-88	NA	NA	NA	NA	0.011u	0.011u	0.011u	0.011u	0.011u	
Beaverton Creek	—	4	15-Nov-89	NA	NA	NA	NA	0.09u	0.09u	0.09u	0.09u	0.36	
			09-Nov-88	NA	NA	NA	NA	0.01u	0.01u	0.01u	0.01u	0.01u	
Yamhill River	—	5	27-Oct-89	NA	NA	NA	NA	0.045u	0.045u	0.045u	0.045u	0.045u	3000
			15-Aug-88	NA	NA	NA	NA	0.012u	0.012u	0.012u	0.012u	0.012u	41100
Conser Slough	—	0.1	05-Oct-89	NA	NA	NA	NA	0.06u	0.06u	0.06u	0.49j	0.06u	1900

LEGEND:

u = Material was analyzed for but not detected.
m = Presence of material verified but not quantified.
j = Estimated value; value not accurate.
NA = Not Analyzed.

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Summary: Sediment Dioxin and Furan Analyses

Basin	Station	River Mile	Date	Lab	Analytical Method	Chemicals																
						TOC (mg/kg — Wet)	2,3,7,8 TCDD (ng/kg — Wet)	1,2,3,7,8 PeCDD (ng/kg — Wet)	1,2,3,4,7,8 HxCDD (ng/kg — Wet)	1,2,3,6,7,8 HxCDD (ng/kg — Wet)	1,2,3,7,8,9 HxCDD (ng/kg — Wet)	1,2,3,4,6,7,8 HpCDD (ng/kg — Wet)	OCDD (ng/kg — Wet)	2,3,7,8 TCDF (ng/kg — Wet)	1,2,3,7,8 PeCDF (ng/kg — Wet)	2,3,4,7,8 PeCDF (ng/kg — Wet)	1,2,3,4,7,8 HxCDF (ng/kg — Wet)	1,2,3,6,7,8 HxCDF (ng/kg — Wet)	2,3,4,6,7,8 HxCDF (ng/kg — Wet)	1,2,3,7,8,9 HxCDF (ng/kg — Wet)	1,2,3,4,6,7,8 HpCDF (ng/kg — Wet)	1,2,3,4,7,8,9 HpCDF (ng/kg — Wet)	OCDF (ng/kg — Wet)
1990 — 1991 Analytical Results																						
Willamette	McFarland Site 1 (Amazon Cr. Drainage)		—	Alta	EPA 1613A	37000	10	54	93	300	170	6300	49000	2.2u	3.8u	26	3.2u	31u	75	9.1u	1400	77	3900
	McFarland Site 2 (Amazon Cr. Drainage)		—	Alta	EPA 1613A	34600	4.2	15	18	53	21	920	7800	5.4u	2.9	6.1	7.9	7.7	15	0.22u	170	0.22u	770
	Baxter Site 3 (Amazon Cr. Drainage)		—	Alta	EPA 1613A	34400	43	480	1400	12000	2700	220000	1700000	98	320	740	780	650	1100	690	16000	620	33000
	Taylor Site 4 (S. Yamhill)		—	Alta	EPA 1613A	8300	66	180	140	600	230	13000	100000	12	34	56	83	51	98	39	1400	560	3900
	Taylor Site 5 (S. Yamhill)		—	Alta	EPA 1613A	7900	23	82	260	1500	550	34000	280000	19	65	140	82u	82u	190	100	4200	180	3600
Mid Fork Willamette	Jasper (WR6A)	8	1990	Alta	EPA 1613A	6200	0.28u	0.68	1.1	3.1	1.4	53	450	0.39u	0.23	0.58	0.46	0.26	0.74	0.1u	6.8	0.056u	22
	Harrisburg	161	1991	Alta	EPA 1613A	13740	0.18u	0.29u	0.53u	1.6	1.2	22	130	0.26u	0.18u	0.35	0.45u	0.38u	0.62	0.23u	3.9	0.16u	9.1
	Halsey (WR4C)	147	1990	Alta	EPA 1613A	3200	0.42	2	3.8	26	8.2	540	5600	0.47u	0.96	2.1	3.6	1.8	3.7	0.12u	49	4.2	210
			1991	Alta	EPA 1613A	7810	0.23u	0.25u	0.45u	0.71	0.38u	9.4	79	0.25u	0.16u	0.16u	0.26u	0.19u	0.46	0.22u	2.3	0.17u	5.7
		145	1991	Alta	EPA 1613A	7590	0.2u	0.2u	0.39u	0.52	0.35u	6.7	49	0.19u	0.18u	0.17u	0.25u	0.2u	0.51	0.16u	1.6	0.16u	4.4

LEGEND:

u = Material was analyzed for but not detected.

SAIWII5563.5

APPENDIX

D

Tables — Fish Tissue Data

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Summary: Fish Tissue Metals Analyses

River	Station	River Mile	Sample Date	Species	Number	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals										
										Arsenic (mg/kg - Wet)	Cadmium (mg/kg - Wet)	Chromium (mg/kg - Wet)	Copper (mg/kg - Wet)	Lead (mg/kg - Wet)	Mercury (mg/kg - Wet)	Zinc (mg/kg - Wet)	Barium (mg/kg - Wet)	Beryllium (mg/kg - Wet)	Selenium (mg/kg - Wet)	Thallium (mg/kg - Wet)
Willamette River	SP&S Bridge	7	13-Jul-90	Squawfish	1	wb															
			13-Jul-90	Squawfish	1	wb															
			13-Jul-90	Squawfish	1	wb															
			13-Jul-90	Carp	1	ef															
			13-Jul-90	Carp	1	ef															
			13-Jul-90	Carp	1	ef															
			29-Aug-89	Carp	1	ef	445	1362	0.72	0.07u	0.02	0.03u	0.56	0.03u	0.17	10.15	NA	NA	NA	NA
			29-Aug-89	Carp	1	ef	419	1135	0.99	0.07u	0.01u	0.03u	0.63	0.03u	0.11	9.55	NA	NA	NA	NA
			29-Aug-89	Carp	1	ef	438	1362	1.42	0.07u	0.01u	0.03u	0.78	0.03u	0.14	12.37	NA	NA	NA	NA
			24-Aug-89	Carp	5	ef (Comp)	914	908	0.134	0.03u	0.01u	0.03u	0.20	0.03	0.19	8.14	NA	NA	NA	NA
							1041	1022												
							1054	1362												
							1118	1476												
							1308	2270												
	Doane Lake	7	24-Aug 88	Carp	5	ef (Comp)	953	1022	0.257	0.03u	0.01u	0.03u	0.16	0.05u	0.17	12.47	NA	NA	NA	NA
							965	1022												
							991	1135												
							864	908												
							1041	1249												
	Kellogg Creek	18	01-Sep-89	Carp	4	ef (Comp)	635	388	0.9	0.07u	0.01u	0.03u	0.30	0.03u	0.14	7.07	NA	NA	NA	NA
							476	1589												
							470	1382												
							438	1135												
				Sucker	3	ef (Comp)	356	568	0.4	0.07u	0.01u	0.03u	0.27	0.03u	0.05	5.64	NA	NA	NA	NA
							337	454												
							318	454												

Summary: Fish Tissue Metals Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Number	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals											
										Arsenic (mg/kg – Wet)	Cadmium (mg/kg – Wet)	Chromium (mg/kg – Wet)	Copper (mg/kg – Wet)	Lead (mg/kg – Wet)	Mercury (mg/kg – Wet)	Zinc (mg/kg – Wet)	Barium (mg/kg – Wet)	Beryllium (mg/kg – Wet)	Selenium (mg/kg – Wet)	Thallium (mg/kg – Wet)
Willamette River (Continued)	Down Stream Oregon City	27	22-Aug-88	Bass	3	sf (Comp)	445	227 TW	NA	0.05u	0.01u	0.03u	0.23	0.03u	0.1	5.8	NA	NA	NA	NA
							470														
							521														
				Carp	3	sf (Comp)	1130	1589	3.53	0.03u	0.01u	0.03u	0.18j	0.03u	0.46j	4.85j	NA	NA	NA	NA
							1168	1816													
							1245	2043													
				Squawfish	3	sf (Comp)	457	681 TW	NA	0.03u	0.01u	0.03u	0.24	0.03u	0.34	4.98	NA	NA	NA	NA
							559														
							1041														
				Carp	3	sf (Comp)	1245	2043	0.102	0.03u	0.01u	0.03u	0.13	0.03u	0.2	7.28	NA	NA	NA	NA
							1168	1589													
							1270	2270													
	Upstream Oregon City	28	30-Aug-89	Carp	1	sf	635	3405	0.4	0.07u	0.01u	0.04	0.54	0.03u	0.14	6.7	NA	NA	NA	NA
					1	lvr	635	3405													
					1	sf	686	5535	3.8	0.07u	0.01u	0.03u	0.41	0.03u	0.18	10.48	NA	NA	NA	NA
					1	lvr	686	5535													
					1	sf	483	1816	0.3	0.07u	0.02	0.03u	0.42	0.03u	0.15	14.56	NA	NA	NA	NA
					1	lvr	483	1816													
	Wilsonville	38	28-Aug-89	Sucker	5	sf (Comp)	480	454	0.43	0.08	0.01u	0.03u	0.2	0.03u	0.11	5.1	NA	NA	NA	NA
							460	340													
							420	340													
							360	227													
							360	227													
				Squawfish	5	sf (Comp)	390	454	0.74	0.08u	0.01u	0.03u	0.31	0.03u	0.23	6.08	NA	NA	NA	NA
							300	227													
							280	114													

Summary: Fish Tissue Metals Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Number	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals										
										Arsenic (mg/kg — Wet)	Cadmium (mg/kg — Wet)	Chromium (mg/kg — Wet)	Copper (mg/kg — Wet)	Lead (mg/kg — Wet)	Mercury (mg/kg — Wet)	Zinc (mg/kg — Wet)	Barium (mg/kg — Wet)	Beryllium (mg/kg — Wet)	Selenium (mg/kg — Wet)	Thallium (mg/kg — Wet)
Willamette River (Continued)	Wilsonville (Continued)	38	28-Aug-89	Squawfish (Continued)	5	af	280	114													
							280	114													
			23-Aug-88	Carp	3	af (Comp)	1245	2043	3.663	0.03u	0.01u	0.03u	0.19	0.03u	0.12	16.28	NA	NA	NA	NA
							1295	2270													
							1295	2724													
				Squawfish	5	af (Comp)	810	341 TW	3.326	0.04u	0.01u	0.03u	0.24	0.03u	0.14	7.88	NA	NA	NA	NA
							495														
							483														
							533														
							495														
	Newberg	46	31-Aug-89	Carp	1	af	533	2384	0.9	0.07u	0.01u	0.03u	0.15	0.03u	0.1	4.97	NA	NA	NA	NA
					1	lvr	533	2384													
					1	af	584	3178	3.8	0.1	0.01u	0.03u	0.33	0.03u	0.02	6.91	NA	NA	NA	NA
					1	lvr	584	3178													
			23-Aug-88	Carp	5	af (Comp)	1372	2588	1.139	0.3u	0.01u	0.03u	0.22	0.03u	0.16	9.9	NA	NA	NA	NA
							1321	2043													
							1473	3632													
							1549	4086													
							1524	3519													
				Squawfish	5	af (Comp)	495	795 TW	0.249	0.3u	0.01u	0.03u	0.17	0.03u	0.44	4.65	NA	NA	NA	NA
							533														
							572														
							673														
							699														
	Wheatland Ferry	74	13-Jul 90	Squawfish	1	wb															
					1	wb															

Summary: Fish Tissue Metals Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Number	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals										
										Arsenic (mg/kg – Wet)	Cadmium (mg/kg – Wet)	Chromium (mg/kg – Wet)	Copper (mg/kg – Wet)	Lead (mg/kg – Wet)	Mercury (mg/kg – Wet)	Zinc (mg/kg – Wet)	Barium (mg/kg – Wet)	Beryllium (mg/kg – Wet)	Selenium (mg/kg – Wet)	Thallium (mg/kg – Wet)
Willamette (Continued)	Wheatland Ferry (Continued)	74	13-Jul-90	Squawfish	1	wb														
				Carp	1	ef														
					1	ef														
					1	ef														
			31-Aug-89	Carp	1	ef	559	2157	0.5	0.06u	0.01u	0.03u	0.36	0.03u	0.12	5.91	NA	NA	NA	NA
					1	lvr	559	2157												
					1	ef	572	2611	0.6	0.08u	0.01u	0.03u	0.54	0.03u	0.12	9.11	NA	NA	NA	NA
					1	lvr	572	2611												
					1	ef	553	2384	0.2	0.07u	0.01u	0.03u	0.39	0.03u	0.2	6.54	NA	NA	NA	NA
					1	lvr	553	2384												
	Corvallis	131	16-Jul-90	Squawfish	1	wb														
					1	wb														
					1	wb														
				Carp	1	ef														
					1	ef														
					1	ef														
	Halsey	147	16-Jul-90	Squawfish	1	wb														
					1															
					1															
				Cut Trout	1															
					1															
					1															
					1															
	Harrisburg	161	16-Jul-90	Squawfish	1	wb														
					1	wb														

Summary: Fish Tissue Metals Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Number	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals										
										Arsenic (mg/kg – Wet)	Cadmium (mg/kg – Wet)	Chromium (mg/kg – Wet)	Copper (mg/kg – Wet)	Lead (mg/kg – Wet)	Mercury (mg/kg – Wet)	Zinc (mg/kg – Wet)	Barium (mg/kg – Wet)	Beryllium (mg/kg – Wet)	Selenium (mg/kg – Wet)	Thallium (mg/kg – Wet)
Willamette River (Continued)	Harrisburg (Continued)	181	18-Jul-90	Squawfish	1	wb														
				Cut Trout	1	wb														
					1	wb														
			16-Oct-90	Cut Trout	1	wb														
					1	wb														
					1	wb														
Mid Fork Willamette	Jasper	8	Jul-23-90	Squawfish	1	wb														
					1															
					1															
				Cut Trout	1															
					1															
					1															
Johnson Creek	McLoughlin Blvd.	1.5	Apr-91	Crayfish	NA	af	NA	NA	NA											
					NA	wb	NA	NA	NA	1.57u	0.02	0.08	10.5	0.18	0.03	17.98	2.65	0.1u	2.53u	5.05u
	44th & Umatilla	3	Apr-91	Crayfish	NA	af	NA	NA	NA											
					NA	wb	NA	NA	NA	1.52u	0.04	0.08	15.47	0.13	0.09	19.02	2.72	0.1u	2.53u	5.05u
	92nd & Flavel	6.1	Apr-91	Crayfish	NA	af	NA	NA	NA											
					NA	wb	NA	NA	NA	1.27u	0.02	0.03u	12.17	0.05	0.14	15.04	2.37	0.09u	2.11u	4.23u
	122nd & Leech Gardens	8.3	Apr-91	Crayfish	NA	af	NA	NA	NA											
					NA	wb	NA	NA	NA	1.66u	0.02	0.04u	19.89	0.07	0.12	18.12	5.75	0.11u	2.76u	5.53u
	Jenne Road		Apr-91	Crayfish	NA	af	NA	NA	NA											
					NA	wb	NA	NA	NA	1.62u	0.02	0.07	17.93	0.09	0.11	19.87	5.62	0.11u	2.7u	5.4u
	Hogan Road	16.9	Apr-91	Crayfish	NA	af	NA	NA	NA											
					NA	wb	NA	NA	NA	1.75u	0.05	0.05	18.17	0.07u	0.08	18.41	7.22	0.12u	2.91u	5.83u
	Orient Drive	21	Apr-91	Crayfish	NA	af	NA	NA	NA											
					NA	wb	NA	NA	NA	1.64u	0.06	0.04u	14.17	0.07u	0.05	17.44	4.14	0.11u	2.73u	5.45u

Summary: Fish Tissue Metals Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Number	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals										
										Arsenic (mg/kg — Wet)	Cadmium (mg/kg — Wet)	Chromium (mg/kg — Wet)	Copper (mg/kg — Wet)	Lead (mg/kg — Wet)	Mercury (mg/kg — Wet)	Zinc (mg/kg — Wet)	Barium (mg/kg — Wet)	Beryllium (mg/kg — Wet)	Selenium (mg/kg — Wet)	Thallium (mg/kg — Wet)
Johnson Creek (Continued)	145th		Apr-91	Crayfish	NA	ef	NA	NA	NA											
					NA	wb	NA	NA	NA	1.55u	0.02	0.04	17.51	0.08	0.09	17.72	5.15	0.1u	2.58u	5.5u
Tualatin River	Tualatin	8	1989	Sucker	5	ef	NA	NA												
Yamhill River		5			5	ef	NA	NA												
Santiam River	Mouth	0.5	25-Aug-88	Squawfish	NA	ef	NA	NA	NA	0.03u	0.01j	0.08j	0.27j	0.03u	0.10	8.11J	NA	NA	NA	NA
Conser Slough		0.1	05-Oct-89	Sucker	5	ef	NA	NA	0.2	0.06u	0.01u	0.03u	0.28	0.03u	0.08	5.21	NA	NA	NA	NA
				Squawfish	3	ef	NA	NA	0.2	0.06u	0.01u	0.03u	0.38	0.03u	0.49	5.57	NA	NA	NA	NA

LEGEND:

u = Material was analyzed for but not detected.
j = Estimate value; value not accurate.
NA = Not Analyzed.
ef = Edible Fillet.
wb = Whole Body.
lvr = Liver.
Comp = Composited Sample.
TW = Total Weight.

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Summary: Fish Tissue Pesticides Analyses

River	Station	River Mile	Sample Date	Species	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals																				
									Alpha BHC (mg/kg)	Beta BHC (mg/kg)	Delta BHC (mg/kg)	Lindane (mg/kg)	Heptachlor (mg/kg)	Heptachlor Epoxide (mg/kg)	Endosulfan I (mg/kg)	Endosulfan II (mg/kg)	Endosulfan Sulfate (mg/kg)	Aldrin (mg/kg)	Dieldrin (mg/kg)	Endrin (mg/kg)	Endrin Aldehyde (mg/kg)	4,4' DDE (mg/kg)	4,4' DDD (mg/kg)	4,4' DDT (mg/kg)	Methoxychlor (mg/kg)	Chlordane (mg/kg)	Toxaphene (mg/kg)
Willamette River	SP&S Bridge	7	13-Jul 88	Squawfish	wb				0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.025u	0.075U
			13-Jul 88	Squawfish	wb				0.004	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.052	0.002u	0.002u	0.002u	0.025u	0.025u
			13-Jul 88	Squawfish	wb				0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
			13-Jul 88	Carp	af				0.002u	0.002u	0.002	0.002u	0.003	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.068	0.008	0.007	0.002u	0.025u	NA
			13-Jul 88	Carp	af				0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	NA
			13-Jul 88	Carp	af				0.002u	0.002u	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.053	0.01	0.005	0.002u	0.025u	NA
			29 Aug 88	Carp	af	445	1362	0.72	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.03u	NA
			29 Aug 88	Carp	af	418	1135	8.99	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.028	0.002u	0.002u	0.002u	0.002u	0.032	0.028	0.002u	0.002u	0.025u	NA
			29 Aug 88	Carp	af	438	1362	1.4	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.033	0.083	0.018	0.002u	0.025u	NA
			24 Aug 88	Carp (Comp)	af	914	908	0.134	0.003u	0.003u	NA	0.003u	0.007	0.003u	NA	NA	NA	0.003u	0.003u	0.003u	NA	0.012	0.004	0.003u	0.003u	0.003u	Na
						1041	1022																						
						1054	1362																						
						1118	1478																						
						1308	2270																						
	Deans Lake	7	24-Aug 88	Carp (Comp)	af	953	1022	0.257	0.003u	0.003u	NA	0.003u	0.003u	0.003u	NA	NA	NA	0.003u	0.003u	0.003u	NA	0.012	0.009	0.003u	0.003u	0.003u	NA
						965	1022																						
						991	1136																						
						884	908																						
						1041	1249																						
	Kellogg Creek	18	01-Sep 88	Carp (Comp)	af	635	386	0.9	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.028	0.018	0.009	0.002u	0.025u	NA
						478	1589																						
						470	1362																						
						436	1135																						
				Sucker (Comp)	af	358	568	0.4	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	NA
						337	454																						
						318	454																						

Summary: Fish Tissue Pesticides Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals																				
									Alpha BHC (mg/kg)	Beta BHC (mg/kg)	Delta BHC (mg/kg)	Lindane (mg/kg)	Heptachlor (mg/kg)	Heptachlor Epoxide (mg/kg)	Endosulfan I (mg/kg)	Endosulfan II (mg/kg)	Endosulfan Sulfate (mg/kg)	Aldrin (mg/kg)	Dieldrin (mg/kg)	Endrin (mg/kg)	Endrin Aldehyde (mg/kg)	p,p' DDE (mg/kg)	p,p' DDD (mg/kg)	p,p' DDT (mg/kg)	Methoxychlor (mg/kg)	Chlordane (mg/kg)	Toxaphene (mg/kg)
Willamette River (Continued)	Dawa Stream Oregon City	27	22 Aug 88	Bass (Comp)	sf	445	227 TW	NA	0.005u	0.005u	NA	0.005u	0.005u	0.005u	NA	NA	NA	0.005u	0.005u	0.005u	NA	0.005u	0.005u	0.005u	0.005u	0.005u	NA
						470																							
						521																							
				Carp (Comp)	sf	1130	1589	3.53	0.003u	0.003u	NA	0.003u	0.003u	0.003u	NA	NA	NA	0.003u	0.003u	0.003u	NA	0.073	0.005	0.003u	0.003u	0.003u	NA
						1168	1818																						
						1245	2043																						
				Squawfish (Comp)	sf	457	881 TW	NA	0.004u	0.004u	NA	0.004u	0.004u	0.004u	NA	NA	NA	0.004u	0.004u	0.004u	NA	0.004u	0.004u	0.004u	0.004u	0.004u	NA
						559																							
						1041																							
				Carp (Comp)	sf	1245	2043	0.1	0.003u	0.003u	NA	0.003u	0.003u	0.003u	NA	NA	NA	0.003u	0.003u	0.003u	NA	0.013	0.003u	0.003u	0.003u	0.003u	NA
						1188	1569																						
						1270	2270																						
	Up Stream Oregon City	28	30 Aug 88	Carp	sf	835	3405	0.4	0.004	0.002u	0.002	0.002u	0.005	0.004	0.007	0.002u	0.002u	0.002u	0.01	0.002u	0.002u	0.081	0.021	0.01	0.002u	0.025u	NA
					lvr	835	3405	5.1	0.002u	0.002u	0.002u	0.002u	0.068	0.002u	0.148	0.002u	0.002u	0.002u	0.088	0.002u	0.002u	0.127	0.144	0.218	0.002u	0.025u	NA
					sf	888	5335	3.9	0.004	0.002u	0.005	0.002	0.002u	0.002u	0.002u	0.002u	0.018	0.002u	0.002u	0.002u	0.026	0.102	0.05	0.018	0.002u	0.026u	NA
					lvr	888	5335	16.88	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.352	0.081	0.088	0.268	0.141	0.092	0.832	0.026u	NA
					sf	483	1816	0.3	0.004	0.002u	0.003	0.002u	0.002	0.006	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.081	0.02	0.014	0.002u	0.025u	NA
					lvr	483	1816	1.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Wilsonville	38	28 Aug 88	Sucker (Comp)	sf	480	454	0.43	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u
						460	340																						
						420	340																						
						360	227																						
						360	227																						
				Squawfish (Comp)	sf	390	454	0.74	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u
						300	227																						
						280	114																						
						280	114																						
						280	114																						

Summary: Fish Tissue Pesticides Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals																		
									Alpha BHC (mg/kg)	Beta BHC (mg/kg)	Delta BHC (mg/kg)	Lindane (mg/kg)	Heptachlor (mg/kg)	Heptachlor Epoxide (mg/kg)	Endosulfan I (mg/kg)	Endosulfan II (mg/kg)	Endosulfan Sulfate (mg/kg)	Aldrin (mg/kg)	Dieldrin (mg/kg)	Endrin (mg/kg)	Endrin Aldehyde (mg/kg)	P,P' DDE (mg/kg)	P,P' DDD (mg/kg)	P,P' DDT (mg/kg)	Methoxychlor (mg/kg)	Chlordane (mg/kg)	Toxaphene (mg/kg)
Willamette River (Continued)	Wilsonville (Continued)	38	23 Aug 88	Carp	ol	1245	2043	3.66	0.003u	0.003u	NA	0.003u	0.003u	0.003u	NA	NA	NA	0.003u	0.003u	0.003u	NA	0.007u	0.003u	0.003u	0.003u	0.003u	NA
						1295	2270																				
						1295	2724																				
			23 Aug 88	Squawfish	ol	810	341 TW	2.33	0.008u	0.008u	NA	0.008u	0.008u	0.008u	NA	NA	NA	0.008u	0.008u	0.008u	NA	0.008u	0.008u	0.008u	0.008u	0.008u	NA
						485																					
						483																					
						533																					
						495																					
	Newburg	48	31-Aug 88	Carp	ol	533	2384	0.9	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.007u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	NA
					lvr	533	2384	NA	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.04u	NA
					ol	584	3178	3.8	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.007u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.008	0.002u	0.002u	0.007u	0.025u	NA
					lvr	584	3178	NA	0.003u	0.003	0.003u	0.003u	0.003u	0.003u	0.003u	0.007u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.063	0.003u	0.003u	0.003u	0.03u	NA
			23 Aug 88	Carp	ol	1372	2588	1.14	0.003u	0.003u	NA	0.003u	0.003u	0.003u	NA	NA	NA	0.003u	0.003u	0.003u	NA	0.016	0.003u	0.003u	0.003u	0.003u	NA
						1321	2043																				
						1473	3832																				
						1548	4088																				
						1524	3518																				
			23 Aug 88	Squawfish	ol	495	785 TW	0.25	0.003u	0.003u	NA	0.003u	0.003u	0.003u	NA	NA	NA	0.003u	0.003u	0.003u	NA	0.005	0.003u	0.003u	0.004u	0.004u	NA
						533																					
						672																					
						673																					
						699																					
	Wheatland Ferry	74	13 Jul 88	Squawfish	wb				0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.023	0.002u	0.002u	0.002u	0.025u	0.025u
									0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.042	0.002u	0.002u	0.002u	0.025u	0.025u
									0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.022	0.002u	0.002u	0.002u	0.025u	0.025u
				Carp	ol				0.002u	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.038	0.002u	0.002u	0.002u	0.025u	0.025u
									0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.02	0.004	0.002u	0.002u	0.025u	0.025u

Summary: Fish Tissue Pesticides Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals																			
									Alpha BHC (mg/kg)	Beta BHC (mg/kg)	Delta BHC (mg/kg)	Lindane (mg/kg)	Heptachlor (mg/kg)	Heptachlor Epoxide (mg/kg)	Endosulfan I (mg/kg)	Endosulfan II (mg/kg)	Endosulfan Sulfate (mg/kg)	Aldrin (mg/kg)	Dieldrin (mg/kg)	Endrin (mg/kg)	Endrin Aldehyde (mg/kg)	p,p' DDE (mg/kg)	p,p' DDD (mg/kg)	p,p' DDT (mg/kg)	Methoxychlor (mg/kg)	Chlordane (mg/kg)	Toxaphene (mg/kg)
Willamette River (Continued)	Wheatland Ferry	74	13 Jul 90	Carp	af				0.002u	0.002u	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.047	0.01	0.002u	0.002u	0.025u	0.025u
			31 Aug 90		af	559	2157	0.5	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.007	0.003u	0.003u	0.003u	0.03u	NA
					lar	559	2157	NA	0.003u	0.006	0.003u	0.003u	0.014	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.073	0.055	0.003u	0.003u	0.03u	NA
					af	572	2611	0.8	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.004	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.024	0.012	0.003u	0.003u	0.03u	NA
					lar	572	2611	NA	0.039	0.003u	0.003u	0.045	0.031	0.003u	0.003u	0.003u	0.003u	0.103	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.089	0.03u	NA
					af	553	2384	0.2	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.02	0.003u	0.003u	0.003u	0.013	0.013	0.01	0.003u	0.03u	NA
					lar	553	2384	NA	0.022	0.003u	0.003u	0.034	0.003u	0.003u	0.003u	0.003u	0.003u	0.002u	0.003u	0.003u	0.109	0.003u	0.003u	0.003u	0.003u	0.03u	NA
	Corvallis	131	16 Jul 90	Squawfish	wb				0.002u	0.006	0.002u	0.002u	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.015	0.003	0.002u	0.002u	0.025u	0.025U
					wb				0.002u	0.002u	0.003u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.022	0.008	0.002u	0.002u	0.025u	0.025u
					wb				0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.018	0.002u	0.002u	0.002u	0.025u	0.025u
				Carp	af				0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.004	0.002u	0.002u	0.002u	0.025u	0.025u
					af				0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.008	0.002u	0.002u	0.002u	0.025u	0.025u
					af				0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
	Halsey	147	16 Jul 90	Squawfish	wb				0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.044	0.002u	0.002u	0.002u	0.025	0.025
									0.002u	0.002	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.004	0.002u	0.002u	0.002u	0.033	0.002u	0.002u	0.002u	0.025u	0.025u
									0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.017	0.002	0.002u	0.002u	0.025u	0.025u
			16 Oct 90	Cut Trout	wb				0.002u	0.002u	0.002u	0.002u	0.003	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
									0.002u	0.002u	0.002u	0.002u	0.005	0.002	0.002	0.002u	0.002u	0.002u	0.002	0.002	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
									0.002u	0.002u	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.005	0.002u	0.025u	0.025u
									0.002u	0.002u	0.003	0.002u	0.002	0.002u	0.003u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
									0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
	Harrisburg	161	16 Jul 90	Squawfish	wb				0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
									0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
									0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.022	0.002u	0.002u	0.002u	0.025u	0.025u
			16 Jul 90	Cut Trout	wb				0.002u	0.002u	0.002u	0.002u	0.004u	0.002u	0.002u	0.002u	0.002u	0.003u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
									0.002u	0.002u	0.006	0.002u	0.007	0.002	0.002u	0.002u	0.002u	0.002u	0.003	0.002u	0.002u	0.023	0.002u	0.007	0.002u	0.025u	0.025u
			16 Oct 90	Cut Trout	wb				0.002u	0.002u	0.002	0.002u	0.008	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
									0.002u	0.002u	0.002	0.002u	0.003	0.002u	0.002u	0.002u	0.002u	0.002u	0.002	0.002	0.002u	0.002u	0.003	0.002u	0.002u	0.002u	0.025u	0.025u

Summary: Fish Tissue Pesticides Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals																			
									Alpha BHC (mg/kg)	Beta BHC (mg/kg)	Delta BHC (mg/kg)	Lindane (mg/kg)	Heptachlor (mg/kg)	Heptachlor Epoxide (mg/kg)	Endosulfan I (mg/kg)	Endosulfan II (mg/kg)	Endosulfan Sulfate (mg/kg)	Aldrin (mg/kg)	Dieldrin (mg/kg)	Endrin (mg/kg)	Endrin Aldehyde (mg/kg)	p,p' DDE (mg/kg)	p,p' DDD (mg/kg)	p,p' DDT (mg/kg)	Methoxychlor (mg/kg)	Chlordane (mg/kg)	Toxaphene (mg/kg)
Willamette River (Continued)	Harrisburg		18 Oct 90	Cut Trout					0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
Mid Fork Willamette	Jasper	8	23 Jul 90	Squawfish	wb				0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
									0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
				Cut Trout	wb				0.002u	0.002u	0.002	0.002u	0.007	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
									0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
									0.002u	0.002u	0.002	0.002u	0.004	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	0.025u
Johnson Creek	McLoughlin Blvd		Apr 91	Crayfish	af	NA	NA	NA	0.0026u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.006	0.0025u	0.0025u	0.01u	0.025u	0.6u
					wb	NA	NA	NA	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0026u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.011	0.0025	0.0077	0.01u	0.026u	0.6u
	44th & Umatilla		Apr 91	Crayfish	af	NA	NA	NA	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.005	0.0025u	0.0025u	0.01u	0.025u	0.6u
					wb	NA	NA	NA	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0026u	0.0025u	0.0025u	0.0025u	0.0026u	0.05	0.0026u	0.018	0.01u	0.025u	0.6u
	92nd & Flavel	8.1	Apr 91	Crayfish	af	NA	NA	NA	0.0025u	0.005	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.011	0.0025u	0.0025u	0.01u	0.025u	0.6u
					wb	NA	NA	NA	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0026u	0.0026u	0.0025u	0.014	0.0051	0.0025u	0.01u	0.025u	0.6u
	122nd & Leach Gardens	8.3	Apr 91	Crayfish	af	NA	NA	NA	0.0025u	0.003	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.011	0.0025u	0.0025u	0.01u	0.025u	0.6u
					wb	NA	NA	NA	0.0025u	0.0025u	0.0025u	0.0026u	0.0026u	0.0026u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.045	0.0025u	0.007	0.01u	0.026u	0.6u
	Jenne Road		Apr 91	Crayfish	af	NA	NA	NA	0.0025u	0.0027	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.013	0.0025u	0.0043	0.01u	0.026u	0.6u
					wb	NA	NA	NA	0.0025u	0.0025u	0.0025u	0.0026u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0026u	0.0025u	0.088	0.0042	0.062	0.01u	0.025u	0.6u
	Hagan Road	18.8	Apr 91	Crayfish	af	NA	NA	NA	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.037	0.0025u	0.0025u	0.01u	0.025u	0.6u
					wb	NA	NA	NA	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0026u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.18	0.048	0.22	0.01u	0.026u	0.6u
	Orient Drive		Apr 91	Crayfish	af	NA	NA	NA	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.008	0.0025u	0.0025u	0.01u	0.025u	0.6u
					wb	NA	NA	NA	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.10	0.0025u	0.018	0.01u	0.025u	0.6u
	145th		Apr 91	Crayfish	af	NA	NA	NA	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.008	0.0026u	0.0025u	0.01u	0.025u	0.6u
					wb	NA	NA	NA	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.0025u	0.089	0.0025u	0.018	0.01u	0.025u	0.6u
Tualatin River	Tualatin	8	1989	Sucker	af	NA	NA	0.3	0.003u	0.005	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.008	0.037	0.003u	0.003u	0.003u	NA
Yamhill River		5	1989	Sucker	af	NA	NA	0.2	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002	0.002u	0.002u	0.002u	0.002u	0.002u	0.004	0.008	0.002u	0.002u	0.025u	NA

Summary: Fish Tissue Pesticides Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals																				
									Alpha BHC (mg/kg)	Beta BHC (mg/kg)	Delta BHC (mg/kg)	Lindane (mg/kg)	Heptachlor (mg/kg)	Heptachlor Epoxide (mg/kg)	Endosulfan I (mg/kg)	Endosulfan II (mg/kg)	Endosulfan Sulfate (mg/kg)	Aldrin (mg/kg)	Dieldrin (mg/kg)	Endrin (mg/kg)	Endrin Aldehyde (mg/kg)	4,4' DDE (mg/kg)	4,4' DDD (mg/kg)	4,4' DDT (mg/kg)	Methoxychlor (mg/kg)	Chlordane (mg/kg)	Toxaphene (mg/kg)
Santam River	Mouth	0.5	25 Aug 88	Squawfish	cf	NA	NA	NA	0.004u	0.004u	NA	0.004u	0.004u	0.004u	NA	NA	NA	0.004u	0.004u	0.004u	0.004u	NA	0.004u	0.004u	0.004u	0.004u	0.004u	NA
Conner Slough		0.1	05 Oct 88	Sucker	cf	NA	NA	0.2	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	NA
				Squawfish	cf	NA	NA	0.2	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.002u	0.025u	NA
					cf	NA	NA	0.1	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.03u	NA
		0.1	26 Aug 88	Bass	cf	360	681 TW	0.057	0.003u	0.003u	NA	0.003u	0.005	0.003u	NA	NA	NA	0.003u	0.004	0.004	NA	0.003u	0.003u	0.003u	0.003u	0.003u	NA
						355																							
		0.1	26 Aug 88	Carp	cf	878	908	0.185	0.003u	0.003u	NA	0.003u	0.005	0.003u	NA	NA	NA	0.003u	0.004	0.004	NA	0.003u	0.003u	0.003u	0.003u	0.003u	NA
						1054	1135																						
						1118	1362																						
						1168	1703																						

LEGEND:

u = Material was analyzed for but not detected above the concentration shown.
NA = Not Analyzed.
cf = Edible Fillet.
wb = Whole Body.
liv = Liver.
Comp = Composited Sample.
TW = Total Weight of Composted Fish Analyzed.

SA\WH5725.5

Summary: Fish Tissue PAH Analyses

River	Station	River Mile	Sample Date	Species	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals																											
									Naphthalene (mg/kg)	Azulene (mg/kg)	Acenaphthylene (mg/kg)	Acenaphthene (mg/kg)	Dibenzofuran (mg/kg)	Fluorene (mg/kg)	Dibenzothiophene (mg/kg)	Acridine (mg/kg)	Phenanthrene (mg/kg)	Anthracene (mg/kg)	Carbazole (mg/kg)	Fluoranthene (mg/kg)	Pyrene (mg/kg)	Retene (mg/kg)	Benzo(a) Anthracene (mg/kg)	Chrysene (mg/kg)	Benzo(b) Fluoranthene (mg/kg)	Benzo(k) Fluoranthene (mg/kg)	Perylene (mg/kg)	Benzo(a) Pyrene (mg/kg)	Indeno (1,2,3-cd) Pyrene (mg/kg)	Dibenz(a,h) Anthracene (mg/kg)	Benzo(ghi) Perylene (mg/kg)				
Willamette River	SP&S Bridge	7	13 Jul 90	Squawfish	wb																															
			13 Jul 90	Squawfish	wb																															
			13 Jul 90	Squawfish	wb																															
			13 Jul 90	Carp	af																															
			13 Jul 90	Carp	af																															
			13 Jul 90	Carp	af																															
			29 Aug 89	Carp	af	445	1382																													
			29 Aug 89	Carp	af	416	1135	0.99	0.5			0.6																								
			29 Aug 89	Carp	af	438	1362																													
			24 Aug 88	Carp	af	814	908																													
						1041	1022																													
						1054	1362																													
						1118	1476																													
						1308	2270																													
	Ocone Lake	7	24 Aug 88	Carp	af	953	1022																													
						865	1022																													
						881	1135																													
						864	908																													
						1041	1248																													
	Kellogg Creek	18	01 Sep 89	Carp	af	635	388																													
						478	1589																													
						470	1362																													
						438	1135																													
				Sucker	af	358	568																													
						337	454																													
						318	454																													
	Wheatland Ferry	24	13 Jul 90	Squawfish	wb																															

Summary: Fish Tissue PAH Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals																														
									Naphthalene (mg/kg)	Acenaphthene (mg/kg)	Acenaphthylene (mg/kg)	Anthracene (mg/kg)	Dibenzofuran (mg/kg)	Fluorene (mg/kg)	Dibenzothiophene (mg/kg)	Acridine (mg/kg)	Phenanthrene (mg/kg)	Anthracene (mg/kg)	Carbazole (mg/kg)	Fluoranthene (mg/kg)	Pyrene (mg/kg)	Xylene (mg/kg)	Benz(a) Anthracene (mg/kg)	Chrysene (mg/kg)	Benz(b) Fluoranthene (mg/kg)	Benz(k) Fluoranthene (mg/kg)	Perylene (mg/kg)	Benz(a) Pyrene (mg/kg)	Indeno (1,2,3-cd) Pyrene (mg/kg)	Dibenz(a,h) Anthracene (mg/kg)	Benz(g,h) Perylene (mg/kg)							
Willamette River (Continued)	Wheatland Ferry	74	13-Jul 90	Squawfish	wb																																		
					wb																																		
			13 Jul 90	Carp	of																																		
					of																																		
					of																																		
			31 Aug 90		of	558	2157																																	
					lvr	558	2157																																	
					of	572	2811	0.8																																
					lvr	572	2811																																	
					of	553	2384																																	
					lvr	553	2384																																	
	Corvallis	131	18 Jul 90	Squawfish	wb																																		
					wb																																		
					wb																																		
				Carp	of																																		
					of																																		
					of																																		
	Halsey	107	18 Jul 90	Squawfish	wb																																		
				Cut Trout	wb																																		
	Harrisburg	181	18 Jul 90	Squawfish	wb																																		

Summary: Fish Tissue PAH Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals																										
									Naphthalene (mg/kg)	Azulene (mg/kg)	Acenaphthylene (mg/kg)	Acenaphthene (mg/kg)	Dibenzofuran (mg/kg)	Fluorene (mg/kg)	Dibenzothiophene (mg/kg)	Anthrene (mg/kg)	Phenanthrene (mg/kg)	Anthracene (mg/kg)	Carbazole (mg/kg)	Fluoranthene (mg/kg)	Pyrene (mg/kg)	Retene (mg/kg)	Benzo(a) Anthracene (mg/kg)	Chrysene (mg/kg)	Benzo(b) Fluoranthene (mg/kg)	Benzo(k) Fluoranthene (mg/kg)	Perylene (mg/kg)	Benzo(e) Pyrene (mg/kg)	Indene (1,2,3-cd) Pyrene (mg/kg)	Dibenz(a,h) Anthracene (mg/kg)	Benzo(ghi) Perylene (mg/kg)	
Willamette River (Continued)	Harrisburg (Continued)	161	18 Jul 90	Cut Trout	wb																														
Mid Fork Willamette	Jasper	8	23-Jul 90	Squawfish	wb																														
				Cut Trout	wb																														
Columbia Slough	Bl. Month of North Slough	1	26 Oct 89																																
			15-Aug 88																																
			31-Aug 90																																
	Dump Road	2	15-Aug 88																																
	Denver Ave	6	16 Aug 88																																
Johnson Creek	McLoughlin Blvd		Apr-91	Crayfish	al	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.01u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
					wb	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
	44th & Umatilla		Apr-91	Crayfish	al	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
					wb	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
	82nd & Fiscel	6.1	Apr-91	Crayfish	al	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
					wb	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
	122nd & Leach Gardens	8.3	Apr-91	Crayfish	al	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.01u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
					wb	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
	Jenne Road		Apr-91	Crayfish	al	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u

Summary: Fish Tissue PAH Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals																												
									Naphthalene (mg/kg)	Azulene (mg/kg)	Acenaphthylene (mg/kg)	Acenaphthene (mg/kg)	Dibenzofuran (mg/kg)	Fluorene (mg/kg)	Dibenzothiophene (mg/kg)	Anthrene (mg/kg)	Phenanthrene (mg/kg)	Anthracene (mg/kg)	Carbazole (mg/kg)	Fluoranthene (mg/kg)	Pyrene (mg/kg)	Xylene (mg/kg)	Benzo(a) Anthracene (mg/kg)	Chrysene (mg/kg)	Benzo(b) Fluoranthene (mg/kg)	Benzo(k) Fluoranthene (mg/kg)	Perylene (mg/kg)	Benzo(a) Pyrene (mg/kg)	Indene (1,2,3-cd) Pyrene (mg/kg)	Dibenzo(a,h) Anthracene (mg/kg)	Benzo(ghi) Perylene (mg/kg)
Johnson Creek (Continued)	Jesse Road		Apr-91	Crayfish	ef	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
					wb	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
	Hegan Road	18.9	Apr-91	Crayfish	ef	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
					wb	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
	Orient Drive		Apr-91	Crayfish	ef	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
					wb	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
	145th		Apr-91	Crayfish	ef	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
					wb	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u	0.03u
Tualatin River	Tualatin	8	1988	Sucker	ef	NA	NA																														
Yamhill River		6	1988	Sucker	ef	NA	NA																														
Santiam River	Mouth	0.5	25-Aug-88	Squawfish	ef	NA	NA																														
Conser Slough		0.1	05 Oct 88	Sucker	ef	NA	NA																														
				Squawfish	ef	NA	NA																														

LEGEND:

u = Material was analyzed for but not detected.
NA = Not Analyzed.
ef = Edible Fillet.
wb = Whole Body.

SA\WII5721.5

Summary: Fish Tissue PCB Analyses

River	Station	River Mile	Sample Date	Species	Number	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals									
										3,3',4,4' TCBP (mg/kg)	2,3,3',4,4' PCBP (mg/kg)	3,3',4,4',5' PCBP (mg/kg)	3,3',4,4',5,5' HCBP (mg/kg)	1221 PCB (mg/kg)	1232 PCB (mg/kg)	1242 PCB (mg/kg)	1254 PCB (mg/kg)	1260 PCB (mg/kg)	Total PCB (mg/kg)
Willamette River	SP&S Bridge	7	13-Jul-90	Squawfish	1	wb				0.011	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
			13-Jul-90	Squawfish	1	wb				0.002u	0.002u	0.006	0.002u	0.125u	0.05u	0.025u	0.025u	0.096	0.096
			13-Jul-90	Squawfish	1	wb				0.007	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.209	0.209
			13-Jul-90	Carp	1	ef				0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
			13-Jul-90	Carp	1	ef				0.037	0.006	0.021	0.002u	0.125u	0.05u	0.025u	0.025u	1.403	1.403
			13-Jul-90	Carp	1	ef				0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025	0.025u
			28-Aug-89	Carp	1	ef	445	1382	0.72	NA	NA	NA	NA	0.15u	0.06u	0.03u	0.16	0.03u	0.16
			29-Aug-89	Carp	1	ef	419	1135	0.89	NA	NA	NA	NA	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
			29-Aug-89	Carp	1	ef	438	1382	1.4	NA	NA	NA	NA	0.125u	0.05u	0.025u	0.025u	0.025u	0.119
			24-Aug-89	Carp	5 (Comp)	ef	914	908	0.134	NA	NA	NA	NA	0.015u	0.006u	0.003u	0.003u	0.066	0.066
							1041	1022											
							1054	1362											
							1118	1478											
							1308	2270											
	Doane Lake	7	24-Aug-88	Carp	5 (Comp)	ef	953	1022	0.257	NA	NA	NA	NA	0.015u	0.006u	0.003u	0.003u	0.044	0.044
							965	1022											
							991	1135											
							864	908											
							1041	1249											
	Kellogg Creek	18	01-Sep-89	Carp	4 (Comp)	ef	635	388	0.9	NA	NA	NA	NA	0.125u	0.05u	0.025u	0.36	0.025u	0.36
							476	1589											
							470	1362											
							438	1135											
				Sucker	3 (Comp)	ef	358	568	0.4	NA	NA	NA	NA	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
							337	454											
							318	454											

Summary: Fish Tissue PCB Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Number	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals									
										3,3',4,4' TCBP (mg/kg)	2,3,3',4,4' PCBP (mg/kg)	3,3',4,4',5' PCBP (mg/kg)	3,3',4,4',5,5' HCBP (mg/kg)	1221 PCB (mg/kg)	1232 PCB (mg/kg)	1242 PCB (mg/kg)	1254 PCB (mg/kg)	1260 PCB (mg/kg)	Total PCB (mg/kg)
Willamette River (Continued)	Down Stream Oregon City	27	22-Aug-88	Bass	3 (Comp)	sf	445	227 TW	NA	NA	NA	NA	NA	0.025u	0.01u	0.005u	0.005u	0.005u	0.025u
							470												
							521												
				Carp	3 (Comp)	sf	1130	1589	3.53	NA	NA	NA	NA	0.015u	0.006u	0.003u	0.205	0.118	0.324
							1168	1816											
							1245	2043											
				Squawfish	3 (Comp)	sf	457	681 TW	NA	NA	NA	NA	NA	0.015u	0.006u	0.003u	0.003u	0.003u	0.015u
							559												
							1041												
				Carp	3 (Comp)	sf	1245	2043	0.1	NA	NA	NA	NA	0.015u	0.0087	0.003u	0.003u	0.003u	0.015u
							1168	1589											
							1270	2270											
	Upstream Oregon City	28	30-Aug-88	Carp	1	sf	635	3405	0.4	NA	NA	NA	NA	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
					1	lvr	635	3405	5.1	NA	NA	NA	NA	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
					1	sf	686	5535	3.9	NA	NA	NA	NA	0.125u	0.05u	0.025u	0.025u	0.026u	0.025u
					1	lvr	686	5535	16.66	NA	NA	NA	NA	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
					1	sf	483	1816	0.3	NA	NA	NA	NA	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
					1	lvr	483	1816	1.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Wilsonville	38	28-Aug-88	Sucker	5 (Comp)	sf	480	454	0.43	NA	NA	NA	NA	0.125u	0.05u	0.025u	0.025u	0.025u	0.05u
							460	340											
							420	340											
							360	227											
							360	227											
				Squawfish	5 (Comp)	sf	390	454	0.74	NA	NA	NA	NA	0.125u	0.05u	0.025u	0.025u	0.025u	0.05u
							300	227											
							280	114											

Summary: Fish Tissue PCB Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Number	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals									
										3,3',4,4' TCBP (mg/kg)	2,3,3',4,4' PCBP (mg/kg)	3,3',4,4',5' PCBP (mg/kg)	3,3',4,4',5,5' HCBP (mg/kg)	1221 PCB (mg/kg)	1232 PCB (mg/kg)	1242 PCB (mg/kg)	1254 PCB (mg/kg)	1260 PCB (mg/kg)	Total PCB (mg/kg)
Willamette River (Continued)	Wilsonville (Continued)	38	28-Aug-89 (Cont'd)	Squawfish	5 (Comp)	ef	280	114											
							280	114											
			23-Aug-88	Carp	3 (Comp)	ef	1245	2043	3.68	NA	NA	NA	NA	0.015u	0.006u	0.003u	0.003u	0.015	0.015
							1295	2270											
							1285	2724											
			23-Aug-88	Squawfish	5 (Comp)	ef	610	341 TW	3.33	NA	NA	NA	NA	0.04u	0.016u	0.008u	0.008u	0.008u	0.04u
							495												
							483												
			15-Aug-88	Squawfish			533												
							495												
	Newberg	48	31-Aug-89	Carp	1	ef	533	2384	0.9	NA	NA	NA	NA	0.125u	0.025u	0.025u	0.025u	0.025u	0.025u
					1	lvr	533	2384	NA	NA	NA	NA	NA	0.2u	0.08u	0.04u	0.04u	0.04u	0.2u
					1	ef	584	3178	3.8	NA	NA	NA	NA	0.125u	0.05u	0.025u	0.025u	0.025u	0.125u
					1	lvr	584	3178	NA	NA	NA	NA	NA	0.15u	0.08u	0.03u	0.03u	0.03u	0.15u
			23-Aug-88	Carp	5 (Comp)	ef	1372	2588	1.14	NA	NA	NA	NA	0.015u	0.006u	0.003u	0.109	0.062	0.171
							1321	2043											
							1473	3632											
							1549	4088											
							1524	3519											
				Squawfish	5 (Comp)	ef	495	795 TW	0.25	NA	NA	NA	NA	0.02u	0.008u	0.004u	0.004u	0.004u	0.02u
							533												
							572												
							673												
							699												
	Wheatland Ferry	74	13-Jul-90	Squawfish	1	wb				0.003	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.035	0.035
					1	wb				0.005	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.058	0.058

Summary: Fish Tissue PCB Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Number	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals									
										2,3',4,4' TCBP (mg/kg)	2,3,3',4,4' PCBP (mg/kg)	2,3',4,4',5' PCBP (mg/kg)	3,3',4,4',5,5' HCBP (mg/kg)	1221 PCB (mg/kg)	1232 PCB (mg/kg)	1242 PCB (mg/kg)	1254 PCB (mg/kg)	1260 PCB (mg/kg)	Total PCB (mg/kg)
Willamette (Continued)	Wheatland Ferry (Continued)	74	13-Jul-90	Squawfish	1	wb				0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.026	0.026
				Carp	1	ef				0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
					1	ef				0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
					1	ef				0.002	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
			31-Aug-89	Carp	1	ef	559	2157	0.5	NA	NA	NA	NA	0.15u	0.06u	0.03u	0.03u	0.03u	0.15u
					1	lvr	559	2157	NA	NA	NA	NA	NA	0.15u	0.06u	0.03u	0.03u	0.03u	0.15u
					1	ef	572	2611	0.6	NA	NA	NA	NA	0.15u	0.06u	0.03u	0.03u	0.03u	0.15u
					1	lvr	572	2611	NA	NA	NA	NA	NA	0.15u	0.06u	0.03u	0.03u	0.03u	0.15u
					1	ef	553	2384	0.2	NA	NA	NA	NA	0.15u	0.06u	0.03u	0.03u	0.03u	0.15u
					1	lvr	553	2384	NA	NA	NA	NA	NA	0.15u	0.06u	0.03u	0.03u	0.03u	0.15u
	Corvallis	131	16-Jul-90	Squawfish	1	wb				0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
					1	wb				0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
					1	wb				0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
				Carp	1	ef				0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
					1	ef				0.002	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
					1	ef				0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
	Halsey	147	16-Jul-90	Squawfish	1	wb				0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.028	0.028
					1					0.003	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.05u
					1					0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.05u
				Cut Trout	1					0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.05u
					1					0.003	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.05u
					1					0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.05u
					1					0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.05u
					1					0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.05u
	Harrisburg	161	18-Jul-90	Squawfish	1	wb				0.002u	0.002u	0.005	0.002u	0.125u	0.05u	0.025u	0.025u	0.085	0.085
					1	wb				0.003	0.002u	0.002	0.002u	0.125u	0.05u	0.025u	0.025u	0.046	0.046

Summary: Fish Tissue PCB Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Number	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals									
										3,3',4,4' TCBP (mg/kg)	2,3,3',4,4' PCBP (mg/kg)	3,3',4,4',5' PCBP (mg/kg)	3,3',4,4',5,5' HCBP (mg/kg)	1221 PCB (mg/kg)	1232 PCB (mg/kg)	1242 PCB (mg/kg)	1254 PCB (mg/kg)	1260 PCB (mg/kg)	Total PCB (mg/kg)
Willamette River (Continued)	Harrisburg (Continued)	161	18-Jul-90	Squawfish	1	wb				0.004	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.033	0.033
				Cut Trout	1	wb				0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
					1	wb				0.003	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
			16-Oct-90	Cut Trout	1	wb				0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
					1	wb				0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
					1	wb				0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
Mid Fork Willamette	Jasper	8	Jul-23-90	Squawfish	1	wb				0.008	0.003	0.004	0.002u	0.125u	0.05u	0.025u	0.025u	0.074	0.074
					1					0.011	0.004	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.112	0.112
					1					0.005	0.002	0.007	0.002u	0.125u	0.05u	0.025u	0.025u	0.131	0.131
				Cut Trout	1					0.003	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
					1					0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
					1					0.002u	0.002u	0.002u	0.002u	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
Columbia Slough	Denver Ave.	5	15-Aug-88											0.13u	0.05u	0.025u	0.025u	0.05u	0.025u
Johnson Creek	McLoughlin Blvd.	1.5	Apr-91	Crayfish	NA	ef	NA	NA	NA										
					NA	wb	NA	NA	NA										
	44th & Umatilla	3			NA	ef	NA	NA	NA										
					NA	wb	NA	NA	NA										
	92nd & Flavel	6.1	Apr-91		NA	ef	NA	NA	NA										
					NA	wb	NA	NA	NA										
	122nd & Leach Gardens	8.3			NA	ef	NA	NA	NA										
					NA	wb	NA	NA	NA										
	Jenne Road		Apr-91		NA	ef	NA	NA	NA										
					NA	wb	NA	NA	NA										
	Hogan Road	16.9	Apr-91	Crayfish	NA	ef	NA	NA	NA										
					NA	wb	NA	NA	NA										
	Orient Drive	21	Apr-91		NA	ef	NA	NA	NA										

Summary: Fish Tissue PCB Analyses *(Continued)*

River	Station	River Mile	Sample Date	Species	Number	Tissue Type	Length (mm)	Weight (g)	Lipid (%)	Chemicals									
										3,3',4,4' TCBP (mg/kg)	2,3,3',4,4' PCBP (mg/kg)	3,3',4,4',5' PCBP (mg/kg)	3,3',4,4',5,5' HCBP (mg/kg)	1221 PCB (mg/kg)	1232 PCB (mg/kg)	1242 PCB (mg/kg)	1254 PCB (mg/kg)	1260 PCB (mg/kg)	Total PCB (mg/kg)
Johnson Creek (Continued)	Orient Drive	21	Apr-91	Crayfish	NA	wb	NA	NA	NA										
	145th	21			NA	ef	NA	NA	NA										
					NA	wb	NA	NA	NA										
Tualatin River	Tualatin	8	1989	Sucker	5	ef	NA	NA	0.3	NA	NA	NA	NA	0.15u	0.06u	0.03u	0.03u	0.03u	0.15u
Yamhill River		5			5	ef	NA	NA	0.2	NA	NA	NA	NA	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
Santiam River	Mouth	0.5	25-Aug-88	Squawfish	NA	ef	NA	NA	NA	NA	NA	NA	NA	0.02u	0.008u	0.004u	0.004u	0.004u	0.02u
Conser Slough	Albany	0.1	05-Oct-89	Sucker	5	ef	NA	NA	0.2	NA	NA	NA	NA	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
				Squawfish	3	ef	NA	NA	0.2	NA	NA	NA	NA	0.125u	0.05u	0.025u	0.025u	0.025u	0.025u
				Squawfish	4	ef	NA	NA	0.1	NA	NA	NA	NA	0.15u	0.06u	0.03u	0.03u	0.03u	0.15u
			25-Aug-88	Bass	2 (Comp)	ef	360	681	0.057	NA	NA	NA	NA	0.015u	0.06u	0.225u	0.003u	0.003u	0.225
							355	681											
			25-Aug-88	Carp	4	ef	978	908	0.185	NA	NA	NA	NA	0.015u	0.008u	0.242	0.132	0.003u	0.374
							1054	1135											
							1118	1362											
							1158	1703											

LEGEND:

u = Material was analyzed for but not detected.
NA = Not Analyzed.
ef = Edible Fillet.
wb = Whole Body.
lvr = Liver.
Comp. = Composited Sample.

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Summary: Fish Tissue Dioxin Analyses

River	Station	Sample Date	Species	Chemicals																	
				2,3,7,8 TCDD (ng/kg)	1,2,3,7,8 PeCDD (ng/kg – Wet)	1,2,3,4,7,8 HxCDD (ng/kg – Wet)	1,2,3,6,7,8 HxCDD (ng/kg – Wet)	1,2,3,7,8,9 HxCDD (ng/kg – Wet)	1,2,3,4,6,7,8 HpCDD (ng/kg – Wet)	OCDD (ng/kg – Wet)	2,3,7,8 TCDF (ng/kg – Wet)	1,2,3,7,8 PeCDF (ng/kg – Wet)	2,3,4,7,8 PeCDF (ng/kg – Wet)	1,2,3,4,7,8 HxCDF (ng/kg – Wet)	1,2,3,6,7,8 HxCDF (ng/kg – Wet)	2,3,4,6,7,8 HxCDF (ng/kg – Wet)	1,2,3,7,8,9 HxCDF (ng/kg – Wet)	1,2,3,4,6,7,8 HpCDF (ng/kg – Wet)	1,2,3,4,7,8,9 HpCDF (ng/kg – Wet)	OCDF (ng/kg – Wet)	TEC w & nd (ng/kg – Wet)
McKenzie	RM 3	21-Nov-90	Mountain Whitefish	0.5u	2u	2.5u	2.2u	1u	6.8u	29u	2.1	0.74u	1.3u	0.48u	0.44u	2.4u	5u	0.46u	0.74u	17u	3.925
				0.57	1.7u	0.84u	0.73u	0.32u	3.4u	1000	2.4	0.75	0.72	0.43u	0.36u	0.71u	0.98u	0.17u	0.31u	36	3.4893
MF Willamette	RM 5	21-Nov-90	Mountain Whitefish	0.57	0.63	0.36u	0.68	0.32u	0.97	4.5	2.7	0.19u	0.24u	0.33u	0.25u	0.11u	1.1u	0.24u	0.32u	1u	1.6203
Willamette	RM 178 – 177	21-Nov-90	Mountain Whitefish	0.87	1.1	0.62u	1.3	0.23u	37	350	4	0.25u	0.58	0.22u	0.18u	0.33	1.8u	1.3u	0.46u	20	3.35
	RM 181	03-Oct-91	Carp	0.41	0.63	0.47	1.7	0.3	5.3	9.3	0.41	0.2	0.46	0.22	0.18	0.23	0.032u	0.44	0.039u	0.21	1.39
		18-Aug-91	Whitefish	0.27	0.31	0.3	0.08	0.12	0.4	2.7	1.7	0.09	0.13	0.08	0.07	0.21	0.08	0.07	0.1	0.18	0.77
	RM 147	19-Aug-90	Mountain Whitefish	2.8	1	0.48u	0.89u	0.5u	0.98u	2.3	13	0.29	0.58	0.15u	0.12u	0.22	0.62u	0.22u	0.25u	0.52	5.21
		19-Nov-90	Mountain Whitefish	4.6	1.6	0.85u	1.7u	0.62u	1.8u	5.6	22	0.74u	0.94u	0.24u	0.21u	0.39u	0.86u	0.46u	0.31u	1.4u	8.65
	RM 145	19-Nov-90	Mountain Whitefish	2.7	0.7u	0.5u	0.83u	0.52u	1.3u	8.3	13	0.35u	0.42u	0.33u	0.25u	0.88u	1.5u	0.43u	0.51u	1.5u	5.07
		08-Sep-91	Carp	0.44	0.38	0.29	1	0.12u	2	5.5	0.54	0.12	0.25	0.14	0.092	0.19	0.057u	0.31	0.061u	0.58	1.02
		08-Aug-91	Whitefish	2.5	0.52	0.19	0.43	0.18	0.62	2.8	8.3	0.12	0.2	0.13	0.15	0.22	0.11	0.15	0.15	0.25	3.85
	RM 143	19-Nov-90	Mountain Whitefish	7.9	1.8u	3.5u	3.1u	0.81u	1.8u	7u	30	0.52u	1.7u	0.8u	0.72u	0.53u	4.3u	0.73u	1.1u	0.46u	14.07
		06-Sep-91	Carp	0.57	0.23u	0.14	0.5	0.11u	1.2	5.4	0.58	0.048u	0.14	0.045u	0.028u	0.16	0.025u	0.17	0.056u	0.21	0.93
		15-Aug-91	Whitefish	1.9	0.45	0.14	0.37	0.17	0.54	3.4	8.6	0.17	0.22	0.12	0.09	0.23	0.13	0.12	0.17	0.32	3.04
	RM 141	06-Sep-91	Carp	0.45	0.24u	0.13	0.34	0.093u	0.84	2.5	0.45	0.045	0.14	0.037u	0.025u	0.13	0.052u	0.17	0.046u	0.14u	0.78
		15-Aug-91	Whitefish	1.4	0.28	0.1	0.22	0.14	0.46	3.9	4.8	0.2	0.14	0.08	0.09	0.2	0.11	0.08	0.13	0.25	2.18

LEGEND:

u = Material was analyzed for but not detected.

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APPENDIX

E

Bibliography

APPENDIX E

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